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ABSTRACT

The Allied Health Professions Projects (AHPP) of the Division of Vocational Education, University of California, Los Angeles, are currently conducting research and development in the allied health occupations in order to design instructional materials of a unique and innovative nature for use in preparing workers for a veriety of allied health occupations. The purpose of this report is to summarize the Project activities relating to the dental auxiliaries and to explore and analyze inter-relationships existing among the three auxiliary occupations (dental assisting, dental hygiene, and dental laboratory technology). Also the report proposes suggestions for the preparation of instructional materials for the dental auxiliaries based upon task analysis which will allow for an integration of instructional materials. Major sections of this report are: (1) Survey Methods, (2) Dental Assisting Survey Data, (3) Dental Laboratory Technicians Survey Data, and (4) Dental Hygiene Data. (Author/JS)

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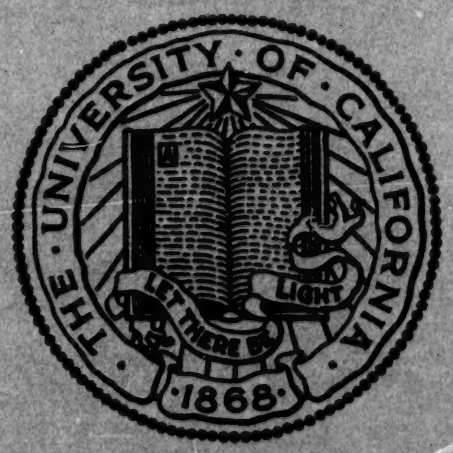
THE UCLA ALLIED HEALTH PROFESSIONS PROJECTS

THE DENTAL AUXILIARY OCCUPATIONS



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DENTAL AUXILIARY OCCUPATIONS

TASK ANALYSIS DATA

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FOREWORD

The Division of Vocational Education, University of California, is an administrative unit of the University concerned with responsibilities for research, teacher education, and public service in the broad area of vocational and technical education. During 1968 the Division entered into an agreement with the U.S. Office of Education to prepare curricula and instructional materials for a variety of allied health areas. For the most part such materials are related to pre-service and in-service instruction in programs from on-the-job training through Associate degree programs.

This report is a presentation of work to date in the development of curricula and instructional materials for the Dental Auxiliary Occupations. A National Technical Advisory Committee for the Auxiliary Dental Occupations provided assistance in designing and conducting a questionnaire to identify tasks performed by Dental Assistants, Dental Hygienists, and Dental Laboratory Technicians throughout the nation. Findings of this survey will be utilized as the bases for curriculum construction for the specialized occupations in the Dental Auxiliary field.

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S U M M A R Y

Objectives

1. To summarize the Project activities relating to the dental auxiliaries and to explore and analyze interrelationships existing among the three auxiliary occupations.

2. To propose suggestions for the preparation of instructional materials for the dental auxiliaries based upon task analysis which will allow for an integration of instructional materials.

Procedure

1. Establishment of a National Technical Advisory Committee representing practitioners, supervisors, educators, and employers of dental auxiliaries.

2. Observation and evaluation of existing dental auxiliary training programs.

3. Collection and analysis of data relevant to occupational activities of dental auxiliaries and to the commonalities which exist among them; identification of commonalities between the Dental Auxiliary Occupations and other allied health occupations.

4. Utilization of survey data to develop curriculum materials that reflect current practices and instructional needs in the Dental Auxiliary Occupation; wherever possible, consideration should be given to the construction of units applicable to curricula for other of the allied health professions.

Findings and Recommendations:

1. The hypothesis that substantial areas of commonality exist among the three Dental Auxiliary Occupations was largely confirmed by findings of the task inventory survey. The three common areas initially so identified were: (1) Orientation; (2) Basic Laboratory; (3) Anatomy. (See Figure 12, page 62, and "Dental Auxiliary Curriculum Units," page 60.) The study revealed, however, that except for certain housekeeping and inventory tasks, Dental Assistants require no formal training in laboratory procedures. Similarly, Dental Hygienists are not required to perform laboratory tasks and so do not require training in this area. It is recommended that these findings be considered in the design of curricula for Dental Assistants and Dental Hygienists.

2. The areas of commonality hypothesized for the Dental Hygienist and Dental Assistant were: (4) Basic Sciences; (5) X-ray; (6) Dental Office Procedures: (7) Dental Assisting; and (8) Dental Health Education. These were confirmed for the two occupational groups except with respect to X-ray procedures. The survey findings made it apparent that X-ray procedures are being performed by selected personnel. It is recommended, therefore, that consideration be given to a modification of curricula to permit only basic X-ray techniques to be taught in the schools and more detailed instruction to be given at the in-service level.

3. Analysis of the survey data confirmed the assignment of instruction in occupational specialties to the three occupational groups as shown in Figure 12, page 62. It was revealed, however, that the Dental Laboratory Technician requires little education or training with respect to office management procedures. Moreover, results of the survey made it obvious that the field of Dental Laboratory Techician is developing highly specialized personnel in the various divisions of laboratory procedures. For this reason, it is possible that complete training in all laboratory procedures may be neither necessary nor desirable. To avoid training and education for which the technician may find no use in his occupational setting, it is recommended that curricula provide opportunities for specialization in line with student preference, labor market demand, and the opinions of experts in the dental laboratory field. Moreover, opportunities for more intensive training in the specialty of his choice should be made available to the student after he has obtained employment in a dental laboratory.

4. With the minor exceptions cited above, it is believed that the validity of the projected dental auxiliary curriculum as detailed on pages 60-61 has been sustained by the survey findings, and it is recommended that this be used as the basis for curriculum development for the Dental Auxiliary Occupations.

5. It is recommended that those instructional units which bridge the various areas of allied health be developed on the basis of interdisciplinary consultation in order to create "core" units adaptable to the needs of appropriate other allied health professions.

6. Two of the instructional units under the X-ray heading, "Creating and developing a latent image: dark-room techniques," and "X-ray physics and safety factors" should be developed cooperatively for potential use in the training of Radiologic Technicians.

I. INTRODUCTION

The Allied Health Professions Projects (AHPP) of the Division of Vocational Education, University of California, Los Angeles, are currently conducting research and development in the allied health occupations. Their intent is to design instructional materials of a unique and innovative nature for use in preparing workers for a variety of allied health occupations.

A. Project Objectives

Two major specific objectives are to be accomplished by the Allied Health Professions Projects: (1) to develop modern and effective curricular materials and instructional methods, and (2) to provide for continuous updating of these materials and their nationwide dissemination. Stated in greater detail, these objectives are:

1. To develop modern curricula and instructional materials for allied health occupations.

    a. To identify by job or task analysis the items to be included in the curriculum for each of the selected occupations; to formulate student performance goals for each; and to determine standards for required skills and knowledge for each occupation, such occupations to be selected on the basis of national and local need.

    b. To develop instructional programs for both pre-service and in-service training for each occupation, with maximum possibility for vertical and horizontal articulation. These programs will consist of instructional modules, with appropriate polysensory multimedia and other instructional materials as needed.

    c. To train teachers in the use of the new programs and materials in continuing (extension) classes by means of local, regional, and national teacher training workshops.

2. To make the results of such curriculum development activities available nationwide, and to devise a means of maintaining updated curricula.

One of the clusters of allied health occupations being considered is the Dental Auxiliary field, consisting of Dental Assisting, Dental Hygiene and Dental Laboratory Technology, for which actual instructional materials are now in the process of being produced and tested. It is the purpose of this

report to summarize the data resulting from the task analysis survey conducted by the Project staff in the field of the Dental Auxiliary Occupations.

To arrive at the objectives listed above, the project methodology requires a detailed job description which is subdivided into a complete list of tasks within the functional area under study.

B. Job Breakdown

A complete inventory of functions within the Dental Auxiliary fields was established by utilizing several sources. Major Dental Auxiliary textbooks were referred to; practicing Dental Auxiliary workers were interviewed and asked to prepare lists of their job activities; and the Project staff contributed information gleaned from personal experience and observation.

The Project goals extend beyond single occupations and into clusters of common fields. For the purpose of identifying possible core curriculum components and functional commonalities, the Dental Auxiliary functional areas were studied concurrently. The completed task list therefore included Dental Laboratory and Dental Hygiene tasks as well as specific Dental Assisting functions.

Following preliminary task identification, the completed draft of the task list was submitted to the National Technical Advisory Committee (see Appendix A) for their comments and modifications. This phase of the task identification was conducted by mail. When the Advisory Committee returned the task list, additions, deletions, and modifications were collated and a master list was prepared.

After the initial task identification, all tasks were grouped into functional areas. Although it was desirable to utilize the same task list for surveying the entire field in order to identify common functions, it was also recognized that some of the functional areas did not apply directly to all the specific occupations in the group, i.e., Dental Assisting, Dental Hygiene, and Dental Laboratory Technology. Therefore, the following functional areas were delineated:

1. X-ray tasks
2. Office and business procedures
3. Dental Assisting and chairside functions
4. Dental Hygiene functions
5. Dental Laboratory tasks

These areas relate to the entire Dental Auxiliary field; however, only in the case of Dental Hygiene were all five sections included in the final task analysis survey instrument.

On completion of the final draft of the job inventory, the National Technical Advisory Committee for the Auxiliary Dental Occupations met for its first session. This meeting was held at the Project headquarters in Los Angeles, California, on September 22 and 23, 1969. A full report of this meeting has been published and is available upon request.

During this meeting, the committee was oriented to the project methodology and philosophies. It then was divided into three subcommittees (see Appendix

B) for work on the task list. The final draft of the task list was presented and the subcommittees considered each task in detail. The Dental Assisting subcommittee worked directly with the Dental Assisting and chairside functional area as well as the office procedures and X-ray lists. The Dental Hygiene subcommittee devoted its time to the Dental Hygiene section of the total list as well as the X-ray functions, and the Dental Laboratory subcommittee conducted a thorough scrutiny of the list of Dental Laboratory functions.

II. SURVEY METHODS

A. Objectives and Design of the Survey Instrument

Although many facts can be collected with respect to an occupational function, the major intent of the Allied Health Professions Projects staff was to gather those data which would be most relevant to the development of instructional materials. To characterize each task fully, as well as to identify the conditions under which tasks may be performed by a given individual, the following areas are included in task analysis:

1. Frequency with which each task is performed.

2. Degree of difficulty encountered in the performance of the task. Even though a single "difficulty" scale may be sufficient for many occupational areas, job performance in several of the allied health fields has a high manual component, and it is often desirable to break the difficulty factor down to the cognitive (knowledge) and the psychomotor (manual) types of difficulty.

3. Criticality of the task, to determine the error cost and hazard.

4. Degree of supervision associated with the performance of a particular task.

5. Human interaction factor that may be associated in the performance of a task.

6. Teaching difficulty, in order to determine which concepts or skills are the most difficult to communicate to a student.

The survey instrument distributed to the Dental Auxiliary workers in the field asked the following questions about each task:

1. Do you do this task as part of your job?

2. How often do you perform this function?

3. What is the depth of knowledge necessary to perform the task well?

4. What level of manual dexterity is required to perform the task well?

Although several methods were used in the design of survey formats, the Dental Auxiliary occupations were surveyed via a format requiring the respondent to complete the entire task list for each question before moving on to the next, rather than completing the survey in a horizontal manner (responding to all four questions about each task before moving on to the next one). This method is less fatiguing to the respondent because he is not required to change his mental set three or four times for each task in a long and involved survey instrument. It is also possible, using this technique, to begin the

task instrument with the most important questions so that if and when the fatigue factor becomes involved, the responses to the less important tasks will be the only ones affected by this factor.

The entire task list was printed on paper cut to 6-1/2 inch depth; there were 25 such pages. The questions, scales, and directions were printed at the top of 11-inch sheets of paper so that all directions and instructions, along with the applicable scales, would be visible above the task list as the respondent answered each of the questions concerning each task. (See Appendix B.) The first two pages of the survey instrument show that the initial instruction required check marks in the column below the arrow, to identify those tasks that were part of his job. The respondent was asked to complete the entire task list in this way by turning the short pages of the survey instrument. As each page was turned, the original instructions and arrow remained visible.

When the final page of the instrument has been completed in this way, the following instructions, printed at the bottom of the first instruction-sheet, became visible:

NOW FOLLOW THE INSTRUCTIONS BELOW

1. Tear out this page. You may throw it away.

2. Return to the first page of task list and follow further instructions.

Removal of the first perforated instruction sheet revealed the following instructions, including an arrow pointing to the appropriate column in the questionnaire.

1. Several times a day
2. Daily--almost daily
3. Several times a week
4. Several times a month
5. Several times a year or less

After returning to the first page of the task list, using the 1-to-5 scale to the left, write the appropriate number in the column under the arrow only for those tasks which you have checked as part of your responsibility.

Turning back to the first page of the survey instrument, the respondent was expected to complete the entire task list by making the appropriate entries in the boxes under "frequency" arrow. Once again, the last page of the questionnaire was followed by instructions to tear out and discard the instruction-sheet and a return to the first page of the task list for responses to a new scale, which concerned level of knowledge required to perform the individual tasks.

Knowledge Level

This scale is designed to evaluate the depth of knowledge necessary to perform the task well.

1. Routine procedure . . . Requires recognition of facts in performing simple procedures.
   Example: Handing instruments.

2. Several procedures with minor decisions . . . Requires interpretation and recall information to perform a series of procedures to complete a task.
   Example: Sterilizing instruments.

3. Select most suitable procedures . . . . . Requires the ability to solve new problems with minimal direction, based on past experience with similar situations.
   Example: Carving wax patterns.

4. Establish and/or modify procedures . . Requires analysis of a situation or problem and the formation of the most suitable procedure for solution.
   Example: Prescribing oral hygiene methods for patients.

5. Making complex decisions with little previous knowledge. . . . . Requires the ability to develop new methods of performance.
   Example: Developing new bookkeeping system.

When the entire task list was completed by indicating the appropriate knowledge level which the respondent associated with each task, this page was also removed and the final scale became visible above the entire task list.

The respondent was asked to enter in the last column what he felt to be the appropriate level of manual skill associated with each task. The scale, along with definitions and examples, is shown below.

Manual Requirement

This scale is designed to evaluate the difficulty of each task in terms of the manual skill required to perform the task well.

1. None . . . . . A manual task which requires no coordination.
   Example: Pushing a button.

2. A little . . . . . Some coordination is required but can normally be done well the first time.
Example: Opening mail.

3. Average . . . . . Requires a little practice to master the dexterity.
Example: Mixing dental cements.

4. Above average . . . . Requires eye-hand coordination that comes only after considerable practice.
Example: Placing rubber dam.

5. A very high degree . . Requires a tactile sensitivity and coordination that is very difficult to achieve.
Example: Working by indirect vision in a mirror.

B. Background Data

In addition to securing the frequency and difficulty data from the task inventory itself, background data regarding the work situation and personal information about the respondent were also requested. Further, it was important to know the type of preparation the respondent had received prior to the work situation. Survey forms were printed on the cover sheets of the survey instruments and were completed by the respondent before proceeding to the questionnaire itself. (See Appendix C.)

Selection of Respondents:

Inasmuch as the intent of the Project is to develop curricula and instructional materials which will have national applicability, respondents to the task analysis survey were selected in a way that would reflect a generalized pattern of dental delivery systems throughout the nation. Although membership rosters available to the Project would have provided the names of certified or licensed individuals in the allied dental field, it was the opinion of the Project staff and the National Technical Advisory Committee that it would be preferable to survey a representative cross-section of the individuals currently working in dental offices, regardless of their affiliations with national organizations or their certification, licensure, etc.

In order to obtain names of people in the Dental Auxiliary field, a survey form was mailed to 1000 dental offices, selected at random from the 1969 American Dental Association Directory. It was the suggestion of the National Technical Advisory Committee that because the data would eventually be utilized in developing training programs in community colleges, and because military training programs already exist, the dentists listed in the Directory whose practice was in the military should be eliminated from the sample. Since it was the Project staff's intent to develop a mailing list of Dental Assistants, Hygienists and Laboratory Technicians who were currently working in dental offices, it was considered advisable to eliminate from the random sampling those dentists who were graduated from Dental School prior to 1955. This graduation date roughly corresponds with the development of the Dental Auxiliary Utilization (DAU) program in dental schools throughout the country.

The committee felt that by utilizing a sampling of more recently licensed dental practitioners, the questionnaire would be most likely to secure more names of currently working dental auxiliaries. This method would also eliminate retired and semi-retired dentists from the sampling.

One thousand survey forms were sent out, accompanied by two cover letters (see Appendix D); 435 forms were returned, containing the names of 470 Dental Assistants secured from the initial form to comprise the final survey sample of 300 Dental Assistants.

Because of the relatively small number of Dental Hygienists located and identified by the initial survey, an additional 150 names were randomly selected from the membership roster of the American Dental Hygienist Association. The number of occupational surveys mailed totaled 307.

To supplement the 52 names of Dental Laboratory Technicians, names and addresses of member laboratories were secured from the National Association of Certified Dental Laboratories, Inc. Forms and cover letters (see Appendix D) were sent to a random sample of 200 laboratories requesting the names of their technicians. From these an additional 150 names were added to the sample list to make a total of 302 laboratory technicians in the survey.

III. DENTAL ASSISTING SURVEY DATA

A. Background Variables

The background data secured from the cover sheet (Appendix C) were designed to provide three basic categories of information.

1. An analysis of the work environment
2. Personal information
3. The respondent's type of pre-service training or preparation.

B. Number of Operatories

An analysis of the data regarding the number of operatories in the work environment (Table 1) indicated that a large proportion of the respondents (about 70 percent) worked in offices where either two or three chairs were in operation. Another 12.7 percent responded that their work environment consisted of four operatories, while only 6.8 percent were working in single-operatory situations.

1. Number of Dentists

With respect to the number of full-time dentists in the work environment (Table 2), 83.3 percent of the respondents indicated that they were working in offices with only one full-time dentist.

The data in Tables 1 and 2 indicate that the Dental Assistant's typical work environment involves a single dentist and multiple operatories.

2. Number of Assistants

In response to the questions about the number of full-time assistants in the work environment (Table 3), equal numbers of respondents (44.1 percent) reported that their work environment included one or two full-time assistants. Approximately 12 percent of the responding dental assistants worked in situations where three or four full-time assistants were part of the staffing pattern.

Table 4 provides data that may be considered related to the dental assisting work environment as given in Table 3, and indicates the number of part-time assistants in the work environment. The presence of one or more part-time assistants was reported by nearly one-fourth of the respondents.

The preceding data not only serve to identify characteristics of the work environment but also have been cross-tabulated with other variables from the background data and will be considered in later tables as combined data.

Table 1. Number of Operatories in Work Environment

Number of Operatories	1	2	3	4	5	6	N.A.
Percent of Total	6.8	45.1	25.5	12.7	1	3	5

(N=102)

Table 2. Number of Dentists (Full-Time) in Work Environment

Number of Dentists	1	2	3	N.A.
Percent of Total	83.3	12.8	1	2.9

(N=102)

Table 3. Number of Assistants (Full-Time) in Work Environment

Number of Assistants	1	2	3	4
Percentage of Total	44.1	44.1	9.8	2.0

(N=102)

Table 4. Number of Assistants (Part-Time) in Work Environment

Number of Assistants (Part-Time)	1	3	4	N.A.
Percentage of Total	19.6	2.9	2.0	75.5

(N=102)

Age of Respondents:

Figure 1 gives the age of the respondents, with approximately 62 percent reporting their ages at 25 or less; the mode age was 20.

Figure 1. Age Distribution of Respondents

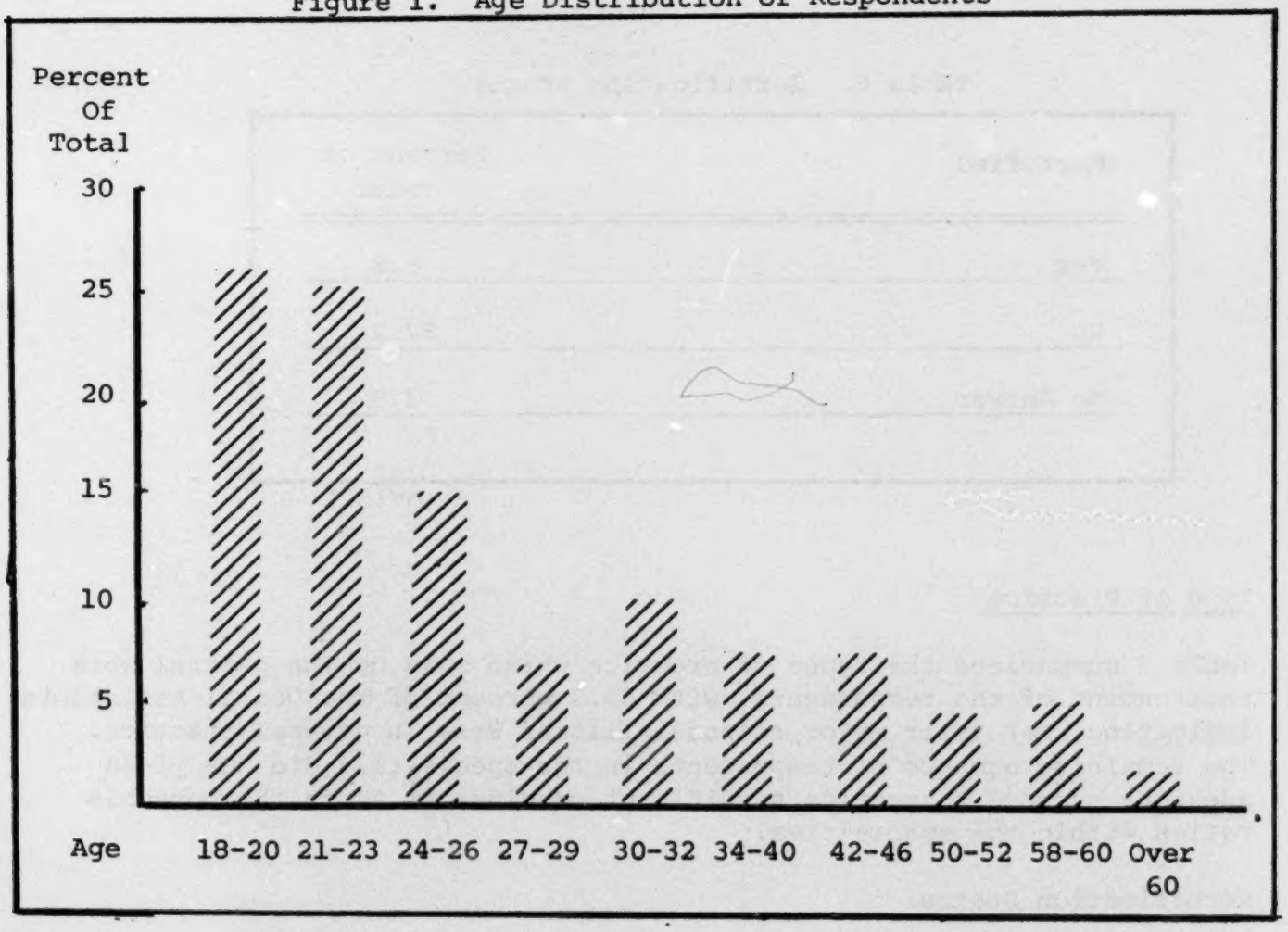


Table 5. Type of Practice

Type	Percent of Total
General	83.3
Pedodontics	1.0
Oral Surgery	5.8
Orthodontics	2.9
Endodontics	3.9
Periodontics	2.0
N.A.	1.1

(N=102)

Table 6. Certification Status

Certified	Percent of Total
Yes	8.8
No	87.2
No Answer	3.9

(N=102)

3. Type of Practice

Table 5 summarizes the types of practice which make up the general work environment of the respondents, with 83.3 percent of the Dental Assistants indicating what their major responsibilities were in general practice. The remaining numbers of respondents in the specialties did not yield adequate numbers to provide significant conclusions as to the possible ratios within the specialties.

Certification Status:

Table 6 summarizes the data secured from the question, "Are you certified?" Only 8.8 percent of the respondents indicated that they were certified at the time of the survey.

4. Type of Training

In summarizing the type of training received by the respondents in the Dental Assistants survey, Table 7 indicates that only a small number (18.5 percent) have been trained in programs which are accreditable, i.e., trade-school, one-year college and two-year junior college training programs. The largest proportion of respondents (61.7 percent) have received only on-the-job training.

Table 7. Type of Training Received by Respondents

Type of Training	Percent of Response
On-The-Job	61.7
104-Hour Course	12.7
Trade School	8.8
One-Year College	6.8
Private School	5.8
Two-Year College	2.9
No Answer	.9

(N=102)

Although the data provided by the above tables may not have a direct relationship to the development of instructional materials and curriculum in the Dental Assisting field, the implication is clear. The high turnover rate, low percentage of certification, and relatively low percentage of respondents in the present work force who have graduated from accredited training programs all indicate that if the work force of the future is to be upgraded and prepared to assume expanded functions and possible licensure in some states, then the responsibilities for training must be significantly expanded in quality and quantity to meet the projected manpower needs for the future of Dental Assisting.

5. Monthly Salary

Respondents were not required to answer the question on salary because such information did not relate directly to the development of instructional material. As a result, of the 102 respondents who completed the survey instrument, only 76 specified their monthly salaries. A report of these responses is given in Table 8. An analysis of these data revealed that the mean monthly salary was $376, whereas both the median and the mode salaries were $400 per month.

Table 8. Monthly Salary

Monthly Salary	Percent of Response
250 or less	7.8
251 - 300	14.3
301 - 350	14.3
351 - 400	35.4
401 - 450	5.2
451 - 500	7.6
501 - 550	5.2
551 - 600	2.6
over 600	2.6

6. Years of Experience

Figure 2 shows the years of experience in Dental Assisting reported by the respondents; 73.4 percent indicate five years or less. When these data are analyzed in light of the age breakdown of Table 6, it is evident that the turnover rate is very high, with the majority of the work force demonstrating the least experience.

Figure 2. Years of Experience as Dental Assistant

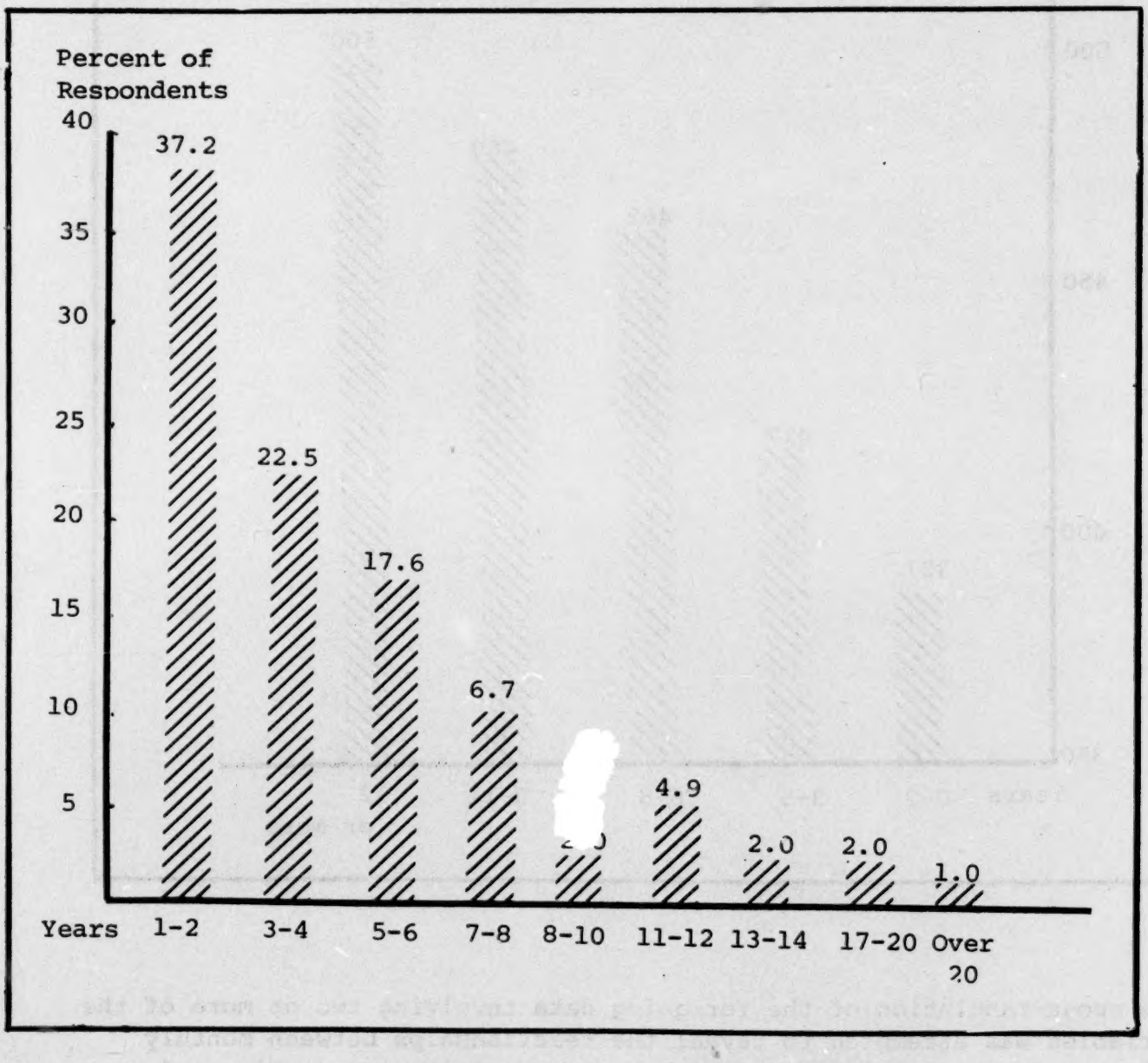
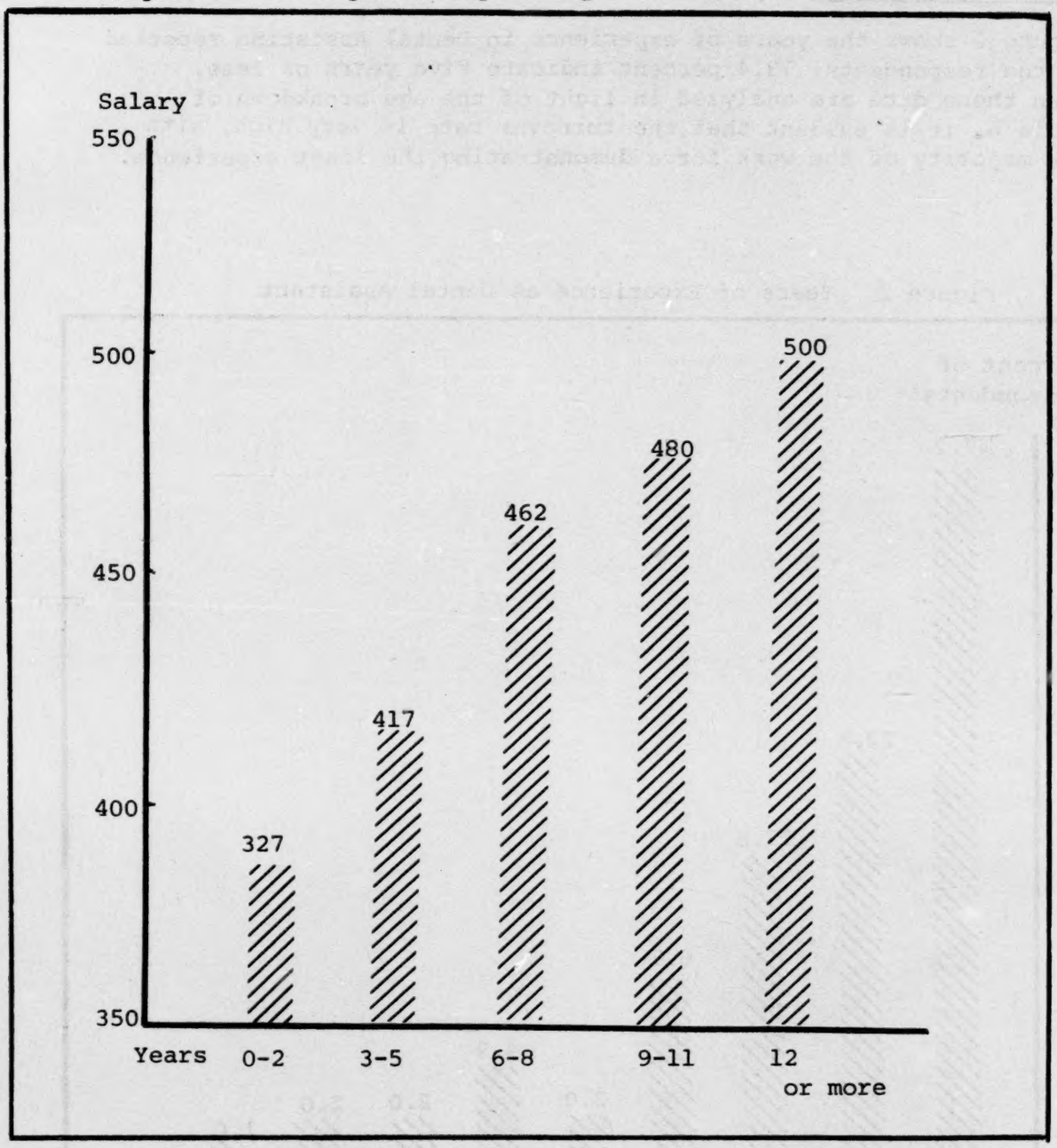


Figure 3. Average Monthly Salary vs. Years of Experience



The cross-tabulation of the foregoing data involving two or more of the variables was attempted to reveal the relationships between monthly salary and other variables within the survey instrument. Figure 3 presents a breakdown of the monthly salary range in terms of the years of experience and shows significant increases in the average monthly salary of those individuals with longer experience on the job in Dental Assisting.

Figure 4. Average Monthly Salary vs. Certification

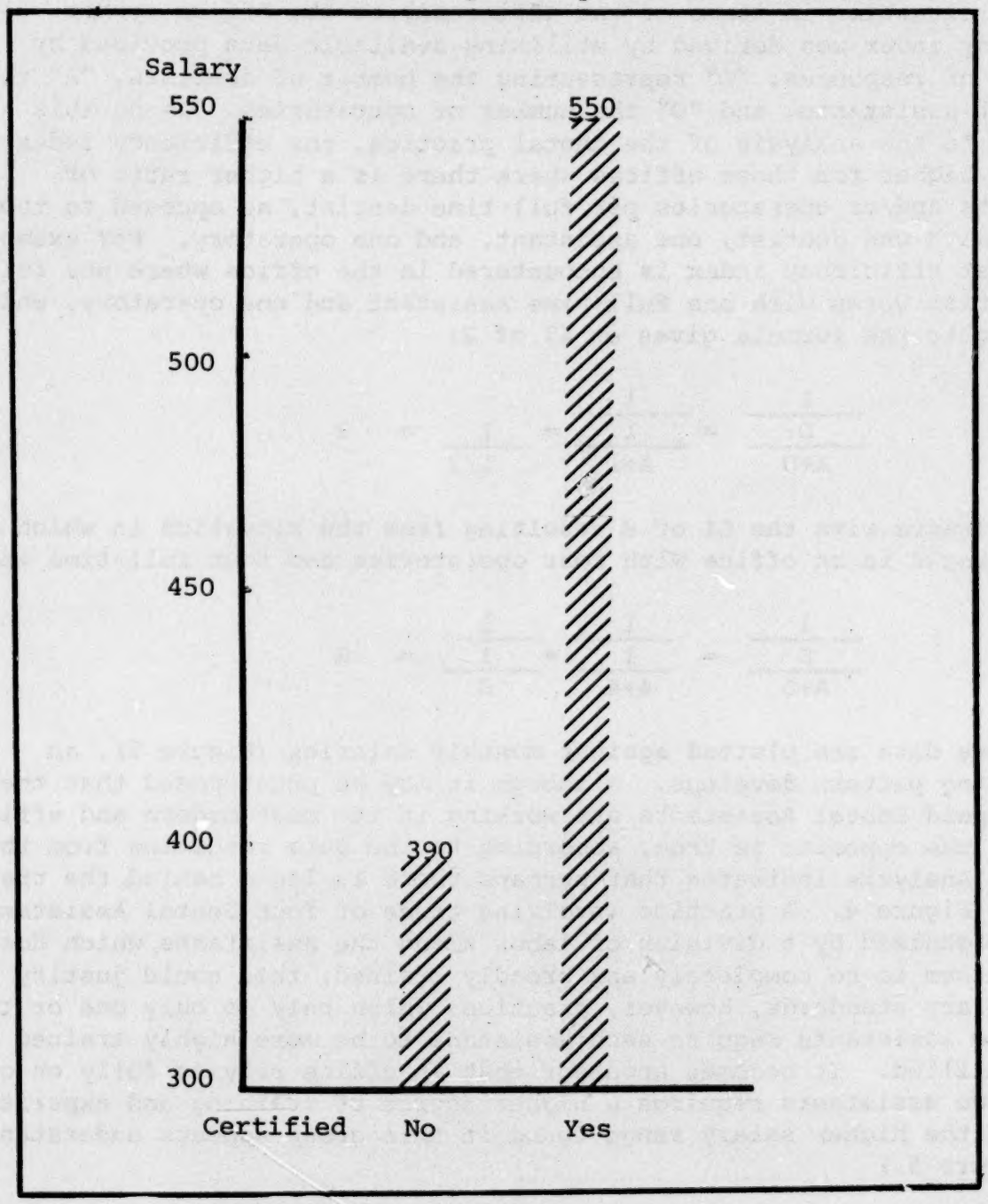


Figure 4 compares monthly salary of those who are certified versus the non-certified, showing a significant difference between these two groups; the certified assistants averaged $550 per month, well above the mean salary for the entire sample, while the non-certified assistants averaged $376 per month.

Another method of cross-reference was designed to determine if there was a relationship between the average monthly salary of the respondents and the work situation in terms of the efficiency of the office system. An efficiency index was derived by utilizing available data provided by analysis of responses, "D" representing the number of dentists, "A" the number of assistants, and "O" the number of operatories. Using this approach to the analysis of the dental practice, the efficiency index (EI) would be higher for those offices where there is a higher ratio of assistants and/or operatories per full-time dentist, as opposed to those offices with one dentist, one assistant, and one operatory. For example, the lowest efficiency index is encountered in the office where one full-time dentist works with one full-time assistant and one operatory, which according to the formula gives an EI of 2:

$$\frac{1}{\frac{D}{A+O}} = \frac{1}{\frac{1}{A+1}} = \frac{1}{1/2} = 2$$

This contrasts with the EI of 8 resulting from the situation in which one dentist works in an office with four operatories and four full-time assistants:

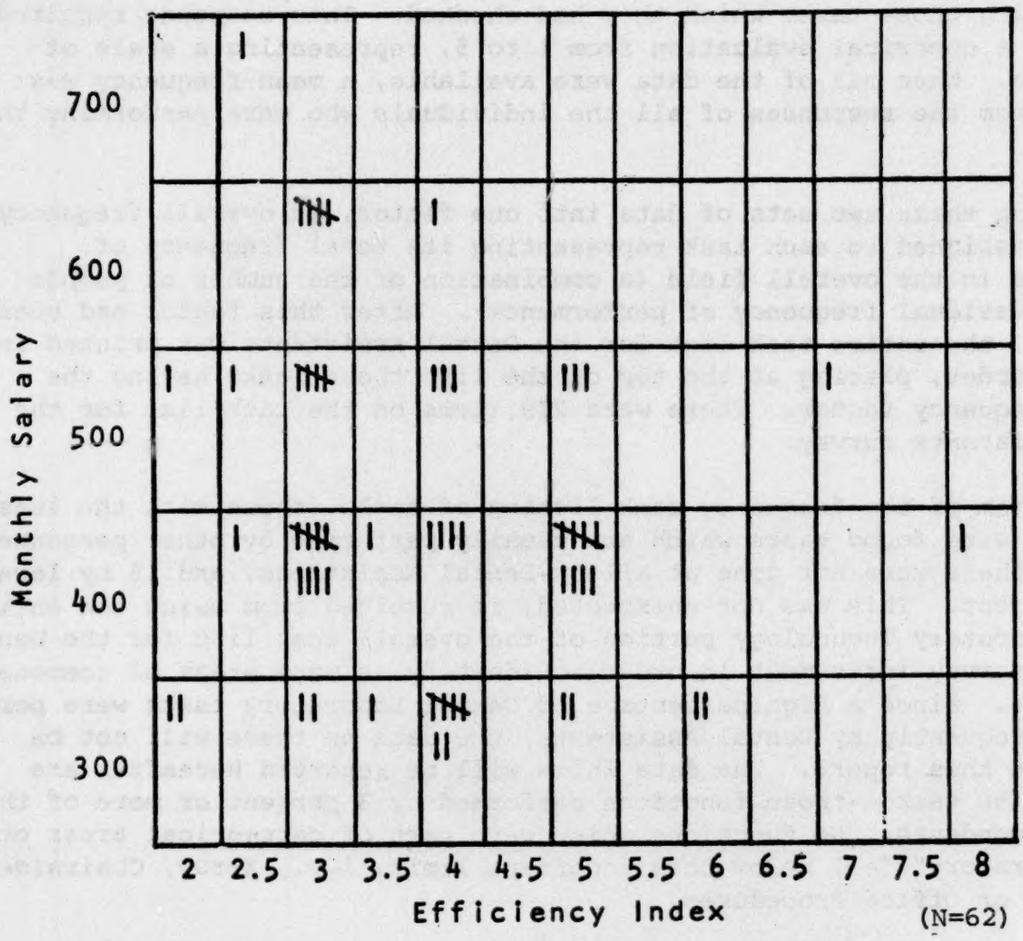
$$\frac{1}{\frac{D}{A+O}} = \frac{1}{\frac{1}{4+4}} = \frac{1}{\frac{1}{8}} = 8$$

When these data are plotted against monthly salaries (Figure 5), an interesting pattern develops. Although it may be presupposed that the highest paid Dental Assistants are working in the most modern and efficient offices, the opposite is true, according to the data resulting from the survey. Analysis indicates that perhaps there is logic behind the trends shown in Figure 4. A practice involving three or four Dental Assistants may be organized by a division of labor among the assistants which does not require them to be completely and broadly trained; this could justify lower salary standards, however, practices which rely on only one or two full-time assistants require each assistant to be more highly trained and widely skilled. It becomes apparent that an office relying fully on only one or two assistants requires a higher degree of training and experience and thus the higher salary range found in this group appears understandable. (See Figure 5.)

7. Summary of Background Data for Dental Assistants

Although the major intent of the survey phase was to perform task analysis for use in curriculum construction, and the background variables are incidental to this purpose, some interesting facts regarding the educational phases became apparent. As responsibilities continue to expand, and there is greater reliance on their skills, the demand for more and better trained Dental Assistants is self-evident. Considering the turnover rate indicated by the foregoing data, the small percentage of assistants currently certified, and relatively small numbers of existing Dental Assistants who have graduated from accredited programs, a significant increase in the quality and quantity of Dental Assistant training programs appears to be imperative.

Figure 5. Monthly Salary vs. Efficiency



From the foregoing data, it seems justifiable to infer that if the dental profession is going to expand the team approach in attempting to deliver dental services to more people, then the dental assisting work force must increase not only in numbers, but also in percentages of certified and formally trained assistants. The responsibility of Dental Assistant educators, both present and projected, is therefore a significant one.

8. Task Analysis

Analysis of the data received from the actual task survey has been carried out in a number of ways. For the sake of clarity, the following data are presented in a series of single tables encompassing the combined data relating to each task in the entire task list.

The frequency of performance for each task was determined by combining two separate data sources. The first response to each of the tasks required a check mark in the column opposite each of the tasks that are now part of their job. From this, it was possible to determine what percentage of respondents within the overall sample were actually doing each of the tasks. The second response to each of the tasks required indicating the frequency of performing those tasks which they had checked. This response required filling in a numerical evaluation from 1 to 5, representing a scale of performance. When all of the data were available, a mean frequency was computed from the responses of all the individuals who were performing the task.

By combining these two sets of data into one factor, an overall frequency value was assigned to each task representing its total frequency of performance in the overall field (a combination of the number of people and the individual frequency of performance). After this factor had been determined, the entire task list for the Dental Assistants was printed in a ranking order, placing at the top of the list those tasks having the highest frequency factor. There were 219 items on the task-list for the Dental Assistants survey.

At the bottom of the frequency rank listing of tasks (those with the least frequency) were found tasks which are usually performed by other personnel. Thirty of these were not done at all by Dental Assistants, and 15 by less than 1 percent. This was not unexpected; it resulted from using the entire Dental Laboratory Technology portion of the overall task list for the Dental Assisting survey instrument in order to identify as many areas of commonality as possible. Since a high percentage of Dental Laboratory tasks were performed infrequently by Dental Assistants, the data on these will not be included in this report. The data which will be reported hereafter are the upper 158 tasks--those functions performed by 3 percent or more of the survey respondents. No functions which were part of categorical areas other than "Laboratory" fell below this 3 percent limit, i.e., X-ray, Chairside Assisting, or Office Procedures.

When the entire task list was ordered by rank, it was also possible to isolate functions according to general categories and list them in an independent ranking order in their own categories. This is how the following tables are reported. The first column indicates the rank held by tasks in the categories of X-ray, Office Procedures, Chairside Procedures and Laboratory Functions. The second column indicates the overall rank in the entire task list before it was divided into categories; i.e., in the X-ray list the task entitled "Develop and fix radiographs" bears the category rank order number 1, since it is the most frequently performed in the X-ray functional list. In the overall task list ranking, this fell in the number 4 position.

Following the task name, the fourth column (percent reporting) indicates the percentage of respondents who reported that they are currently doing this procedure. The fifth column (knowledge level) lists the mean value assigned to the task by the entire sample. The final column (manual requirement) reports the mean value for manual difficulty assigned by the entire sample.

C. Observations and Conclusions

The procedure occupying the median position in the overall task list of 158 items was #79, "Prepare instruments for and operate dry heat sterilizer." It is interesting to note the position of other tasks and groups of tasks relative to this median position as determined by ranking order using the frequency factor. (See Table 9.)

Table 9. Distribution of Tasks

	No. of Functions in Survey	No. Above Median	%Above Median	No. Below Median	%Below Median
1. X-Ray	21	13	62	8	38
2. Office	25	20	80	5	20
3. Chairside	79	44	56	35	44
4. Laboratory	33	2	6	31	94

The two laboratory tasks above the median for Dental Assistants were "Clean and maintain laboratory instruments" and "Maintain laboratory equipment." It is interesting to note that since these two are in reality housekeeping and maintenance procedures, none of the actual laboratory functions were found above the median. The laboratory procedure that was highest on the list was "Pour, trim and articulate casts," which occupies the 88th position (nine items below the median). The next laboratory function, "Give on-the-job instructions to subordinate personnel," was perhaps misinterpreted by Dental Assistants as being a general item rather than relating specifically to dental laboratory procedures. The next highest laboratory procedure, "Store and inventory precious metals," which occupies the 92nd position in the ranking order, was also not a specific laboratory task but involves a general supply and inventory function. Items 96 "Care for preliminary or final impressions" and 100 "Pour final impressions to produce a master cast" and 11 "Pour casts for orthodontic deformities" all relate to the pouring up of impressions.

Other procedures which have traditionally been included in the laboratory phases of Dental Assistants training programs were as follows: "Bead and box complete or partial denture impressions," which occupied the 119th position (40 below the median) and was performed by 15.7% of the Dental Assistants.

"Fabricate impression trays from preliminary impressions," in the 121st position, was being performed by 14.7% of the Dental Assistants. "Fabricate trial base plates and occlusal rims for complete dentures," in the 129th position, is generally being performed by 10.8% of the Dental Assistants. "Sprue and vest and burn out gold alloy inlays, crown or pontics" was 136

items from the top of the ranking (57 items below the median) and is being performed by 6.9% of the Dental Assistants: "Complete simple repairs" showed a response of 8.8% of the Dental Assistants which, combined with its relatively low frequency of performance for these individuals, positions this procedure at 139 below the top or 60 items below the median.

Observation of existing curricula indicated a great variation in the length of time spent in these areas, but the greatest discrepancy is in the field of laboratory techniques. The following table* shows the amount of time in total man-hours in 42 one-year Dental Assistant curricula in each of 20 categorical areas. (See Table 10.) It will be noted that 13 percent of the total time is dedicated to "Office Laboratory Procedures," which is second in total hours only to "Chairside Assisting."

Field survey indicates that only three or four relatively simple laboratory procedures are performed in the field by Dental Assistants frequently enough to justify being included in the curriculum. This is especially true since the time necessary to teach some of the more advanced laboratory procedures such as "Finish and polish gold alloy inlays, crowns, or fixed partial dentures" is being performed in the field by less than 6 percent of the working Dental Assistants, and less than 3 percent responded affirmatively to "Fabricate orthodontics space maintainers or retainers," and "Stabilize base plates."

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* Data provided by American Dental Assistants Association

Table 10. Dental Assistant Curriculum Total Mean Hours

Course	One Year (42 Programs)
1. Dental Organizations, History and Ethics	12.36
2. Certification, State Practice Acts	7.26
3. Sterilization	20.75
4. Medication, Anesthesia	21.25
5. Dental Anatomy	54.46
6. Diet and Nutrition	15.96
7. Oral Pathology	20.27
8. First Aid	17.32
9. Bacteriology	21.05
10. English and Speech	59.66
11. Typing	62.54
12. Chairside Assisting	342.96
13. Dental Materials	63.01
14. Instruments and Equipment Identification and Care	39.23
15. Roentgenology	74.81
16. Office Management	87.64
17. Supplies	14.76
18. Personal Hygiene	13.42
19. Office Laboratory Procedures	96.70
20. Knowledge of Commercial Labs	10.45

ANALYSIS OF RESPONSE TO TASK SURVEY BY FUNCTIONAL AREAS
DENTAL ASSISTANTS

Category Rank Order	Overall Rank Order	X-RAY Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	4	Develop and fix exposed radiographic film.	93.1	1.52	2.26
2	15	Label dental radiographs.	87.3	1.33	1.73
3	19	File dental radiographs.	86.3	1.26	1.58
4	20	Practice patient and operatory safety measures for X-radiation.	72.5	1.32	1.71
5	23	Mount dental radiographs.	83.3	1.59	2.53
6	28	Select film size appropriate for patient's mouth and indicated technique.	65.7	1.88	1.95
7	38	Position patient for radiographic examination.	58.8	1.64	2.31
8	43	Maintain unexposed radiographic film storage.	78.4	1.33	1.39
9	55	Adjust Voltage, amperage, and timer of X-ray machine.	53.9	1.53	1.66
10	59	Select accessories for radiographic (X-ray) technique	45.1	1.73	1.95
11	62	Clean X-ray processing equipment.	79.4	1.33	1.73
12	66	Apply bite-wing radiographic procedures.	47.1	1.80	3.12
13	77	Mix solutions for developing and fixing radiographic film.	79.4	1.49	2.08
14	80	Apply bisecting angle (short cone) procedures for peri-apical radiographic survey.	29.4	2.133	3.41
15	86	Evaluate dental radiographs for diagnostic quality.	25.5	2.20	3.13
16	91	Apply paralleling (long cone) procedures for peri-apical radiographic survey.	20.6	2.14	3.37
17	93	Apply occlusal radiographic prodedures.	25.5	1.80	3.19
18	94	Operate automatic processing equipment.	15.7	1.64	2.14
19	99	Apply extraoral radiographic procedures.	16.7	2.07	2.93
20	109	Supervise subordinates in operating dental X-ray equipment.	17.6	2.18	2.69
21	134	Apply panoramic radiographic procedures.	5.9	2.29	4.00

DENTAL ASSISTANT

Category Rank Order	Overall Rank Order	OFFICE Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	1	Receive and dismiss patients and visitors.	90.2	1.52	1.69
2	3	Receive and place telephone calls.	80.4	2.32	2.20
3	14	Maintain accurate patient dental records.	76.5	1.75	2.20
4	17	Perform housekeeping duties.	81.4	1.20	1.54
5	18	Assemble patient records for treatment.	79.4	1.23	1.67
6	22	Issue receipts.	76.5	1.31	1.79
7	24	Collect fees for dental services.	71.6	1.93	2.32
8	25	File business and patient records.	70.6	2.25	2.61
9	26	Maintain appointment control.	68.6	2.24	2.57
10	34	Make ledger entries.	60.8	1.48	2.02
11	36	Sort incoming mail.	65.7	1.28	1.58
12	49	Verify invoices.	61.8	1.45	1.81
13	56	Order supplies.	77.5	1.96	2.06
14	57	Maintain an active recall system.	61.8	1.90	2.35
15	58	Prepare correspondence.	58.8	2.28	2.44
16	64	Arrange financial agreements.	48.0	2.84	2.80
17	69	Maintain petty cash accounts.	49.0	1.66	1.91
18	70	Prepare bank deposits.	52.0	1.43	2.04
19	75	Write checks and maintain balance.	45.1	1.48	2.17
20	78	Maintain and rotate inventory.	58.8	1.91	2.17
21	81	Prepare statements.	61.8	1.62	2.02
22	85	Complete dental insurance forms.	44.1	2.25	2.61
23	102	Maintain state and federal tax information.	32.4	2.56	2.46
24	110	Reconcile bank statement.	30.4	1.43	2.14
25	133	Prepare tax forms.	16.7	3.06	2.44

DENTAL ASSISTANT

Category Rank Order	Overall Rank Order	CHAIRSIDE Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	2	Seat and dismiss patient from chair.	91.2	1.21	1.56
2	3	Identify various types of dental instruments.	90.2	1.40	2.33
3	5	Recognize various types of dental equipment.	89.2	1.41	2.28
4	6	Deliver and receive instruments at chairside.	90.2	1.34	2.99
5	7	Care for various pieces of dental equipment.	91.0	1.71	2.29
6	8	Clean operatories and equipment.	92.2	1.31	1.91
7	9	Prepare setup for local anesthetic injection.	83.3	1.44	2.01
8	10	Prepare instruments for and operate autoclave.	85.3	1.73	2.13
9	11	Prepare dental materials for placement.	82.4	1.65	2.55
10	12	Prepare and chemically disinfect instruments.	80.4	1.65	1.96
11	16	Assist with amalgam restoration.	78.4	1.53	3.06
12	21	Retract patient's cheek, lips and tongue.	82.4	1.56	2.80
13	27	Triturate amalgam-alloy.	68.6	1.35	2.23
14	29	Prepare setup for prophylaxis (cleaning).	73.5	1.38	1.91
15	31	Assist with oral surgery procedures.	86.3	2.29	3.48
16	32	Aspirate during oral surgery.	78.4	1.61	2.93
17	33	Make proper disposition and distribution of medical or dental records.	60.8	1.48	1.78
18	35	Assist with the administration of local anesthetic.	58.8	1.52	2.13
19	37	Prepare zinc phosphate cement for protective base.	70.6	1.40	2.92
20	39	Record oral conditions as directed by dentist.	65.7	1.52	2.18
21	40	Explain postoperative instructions to patient.	70.6	2.52	2.02
22	41	Apply air to keep cavity preparation dry.	60.8	1.35	2.56
23	42	Prepare silicate for restoration.	65.7	1.64	2.97
24	44	Prepare alginate for impression by dentist.	74.5	1.60	2.67
25	46	Prepare setup for fluoride treatment.	67.6	1.30	1.97
26	47	Retract oral tissues in surgical procedures.	74.5	2.00	3.26
27	48	Instruct patient in Oral Hygiene.	56.9	2.88	2.31
28	50	Evacuate oral cavity during restorative procedure.	51.0	1.40	2.68
29	51	Maintain chain of antisepsis.	49.0	1.71	2.41
30	52	Prepare setup for endodontics (root canal therapy).	77.5	1.87	2.47
31	53	Apply water to tooth during cavity preparation.	53.9	1.50	2.63

Category Rank Order	Overall Rank Order	CHAIRSIDE (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
32	54	Prepare acrylic restoration.	59.8	1.57	2.94
33	60	Fill alginate tray.	62.7	1.40	2.39
34	61	Load carrier and place amalgam in cavity preparation.	46.1	1.26	2.71
35	63	Irrigate oral cavity for rinsing.	45.1	1.27	2.51
36	65	Insert or remove cotton rolls.	45.1	1.27	2.23
37	67	Prepare setup for prosthetics.	60.8	1.73	2.20
38	68	Prepare rubber base material for impression.	65.7	1.60	2.86
39	71	Cut suture material after tying by the the dentist.	65.7	1.48	2.93
40	72	Assist with rubber dam application and removal.	52.9	1.54	3.00
41	73	Prepare setup for periodontal treatments.	57.8	1.79	2.35
42	74	Stabilize patient's mandible during operation.	44.1	1.50	2.28
43	76	Dispense medications when ordered by dentist.	53.9	2.00	2.22
44	79	Prepare instruments for and operate dry-heat sterilizer.	36.3	1.53	2.14
45	82	Prepare compound for impression by dentist.	43.1	1.71	2.55
46	83	Examine and sharpen instruments as required.	43.1	1.93	2.83
47	85	Hold impression in mouth after dentist places impression tray.	43.1	1.43	2.05
48	87	Assist with First Aid procedures.	60.8	2.80	3.00
49	89	Prepare non-carpule hypodermic syringe for injection of medications.	24.5	1.78	2.59
50	95	Prepare hydrocolloid for impression.	27.5	1.61	2.89
51	97	Apply hand mallet in surgical procedures.	30.4	1.66	3.19
52	98	Prepare tray setup for orthodontic treatments.	23.5	1.74	2.23
53	101	Heat or prepare gutta percha for temporary stopping.	22.5	1.40	2.72
54	103	Remove excess cement from crowns of the teeth.	24.5	1.75	2.91
55	104	Remove impressions from patient's mouth.	20.6	1.60	2.68
56	105	Take impressions for study models.	22.5	2.04	3.57
57	106	Cut and remove sutures postoperatively.	21.6	1.86	3.40
58	108	Apply coagulants or administer hemo-statics.	17.6	2.00	2.71
59	113	Apply topical anesthetics.	13.7	1.85	2.25
60	114	Hand triturate amalgam.	9.8	1.40	2.29
61	115	Place matrix for amalgam restoration.	9.8	1.67	3.38
62	116	Prepare setup for gold foil restoration.	29.4	1.87	2.68

DENTAL ASSISTANT

Category Rank Order	Overall Rank Order	CHAIRSIDE (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
63	117	Remove rubber dam.	10.8	1.33	3.18
64	118	Change engine belt on low speed engine.	32.4	1.47	2.70
65	120	Assist with gold foil restoration.	26.5	1.92	3.29
66	122	Remove temporary cement.	13.7	1.69	3.25
67	123	Place temporary cement.	10.8	1.64	3.27
68	124	Receive from dentist and preserve biopsy specimens.	18.6	1.78	2.22
69	125	Assist dentist in hospital operative procedures.	17.6	3.06	4.33
70	126	Preserve and incubate bacterial cultures.	12.7	1.62	2.08
71	128	Condense amalgam restorations.	6.9	1.83	2.67
72	130	Anneal gold foil.	16.7	1.83	3.00
73	131	Assist dentist in hospital oral surgical procedures.	15.7	2.87	4.07
74	132	Place gold foil as directed by operator.	14.7	1.73	3.36
75	137	Remove periodontal surgical pack.	7.8	1.88	2.75
76	138	Place rubber dam.	3.9	2.20	4.00
77	146	Place periodontal surgical pack.	6.9	1.83	3.20
78	151	Hand mallet gold foil.	5.9	1.40	2.25
79	157	Remove medication (dry socket).	3.9	1.50	3.25

DENTAL ASSISTANT

Category Rank Order	Overall Rank Order	LABORATORY Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	30	Clean and maintain laboratory instruments.	73.5	1.36	1.97
2	45	Maintain dental laboratory equipment.	64.7	1.36	2.05
3	88	Pour, trim, and articulate casts.	29.4	2.19	3.25
4	90	Give "on-the-job" instruction to subordinate personnel.	27.5	2.98	2.69
5	92	Store and inventory precious metals.	36.3	1.60	1.86
6	96	Care for preliminary or final impressions.	21.6	1.68	2.80
7	100	Pour final impressions to produce master cast.	21.6	2.00	3.40
8	101	Interpret the dental prescription.	16.75	2.13	2.71
9	111	Pour casts of othodontic deformities.	18.6	1.95	3.40
10	112	Supervise subordinates within the laboratory.	11.8	2.58	2.36
11	119	Remove temporary cement.	13.7	1.69	3.25
12	121	Fabricate impression trays from preliminary impressions.	14.7	2.40	3.43
13	127	Make removable partial denture prosthesis for occlusal adjustments.	14.7	3.00	4.00
14	129	Frabricate trial baseplates and occlusal rims for complete dentures.	10.8	2.75	3.80
15	136	Sprue, invest, and burn out gold alloy inlays, crowns, or pontics.	6.9	2.29	3.50
16	139	Complete simple denture repairs.	8.8	2.56	3.63
17	140	Burn out wax prior to casting.	5.9	1.67	2.67
18	141	Fabricate individual surgical trays for immediate dentures.	4.9	2.25	3.00
19	142	Fabricate stone dies	3.9	2.25	3.60
20	143	Fabricate acrylic r[illegible] jacket crowns and pontics.	20.7	3.00	4.00
21	144	Select artificia[illegible]eth for complete dentures.	4.9	2.60	1.67
22	147	Finish and polish gold alloy inlays, crowns or fixed partial dentures.	5.9	2.50	3.81
23	148	Fabricate temporary removable bite raisers.	3.9	1.75	2.33
24	194	Ditch the die.	3.9	1.25	2.50
25	160	Sandblast chrome castings.	4.9	2.00	1.67
26	165	Replace tube teeth or facings.	3.9	2.25	3.33

IV. DENTAL LABORATORY TECHNICIANS SURVEY DATA

A. Background Variables

The background data secured from the cover sheet on the Dental Laboratory Technicians survey instrument (see Appendix C) were designed to provide essentially the same type of background variable data secured in the other dental auxiliary fields and were divided into three general categories:

The work environment
Personal data
Preparation and experience

The analysis of the data regarding the work situation indicated that of the 72 respondents who returned completed task analysis survey instruments, 55 (76.4 percent) were working in commercial laboratories while 17 (23.6 percent) were working in private offices.

Of the 55 who indicated their work environment was in a commercial laboratory, 35 indicated that it was a general dental laboratory while 20 listed their work environment as a specialty laboratory.

1. Technicians and Laboratory

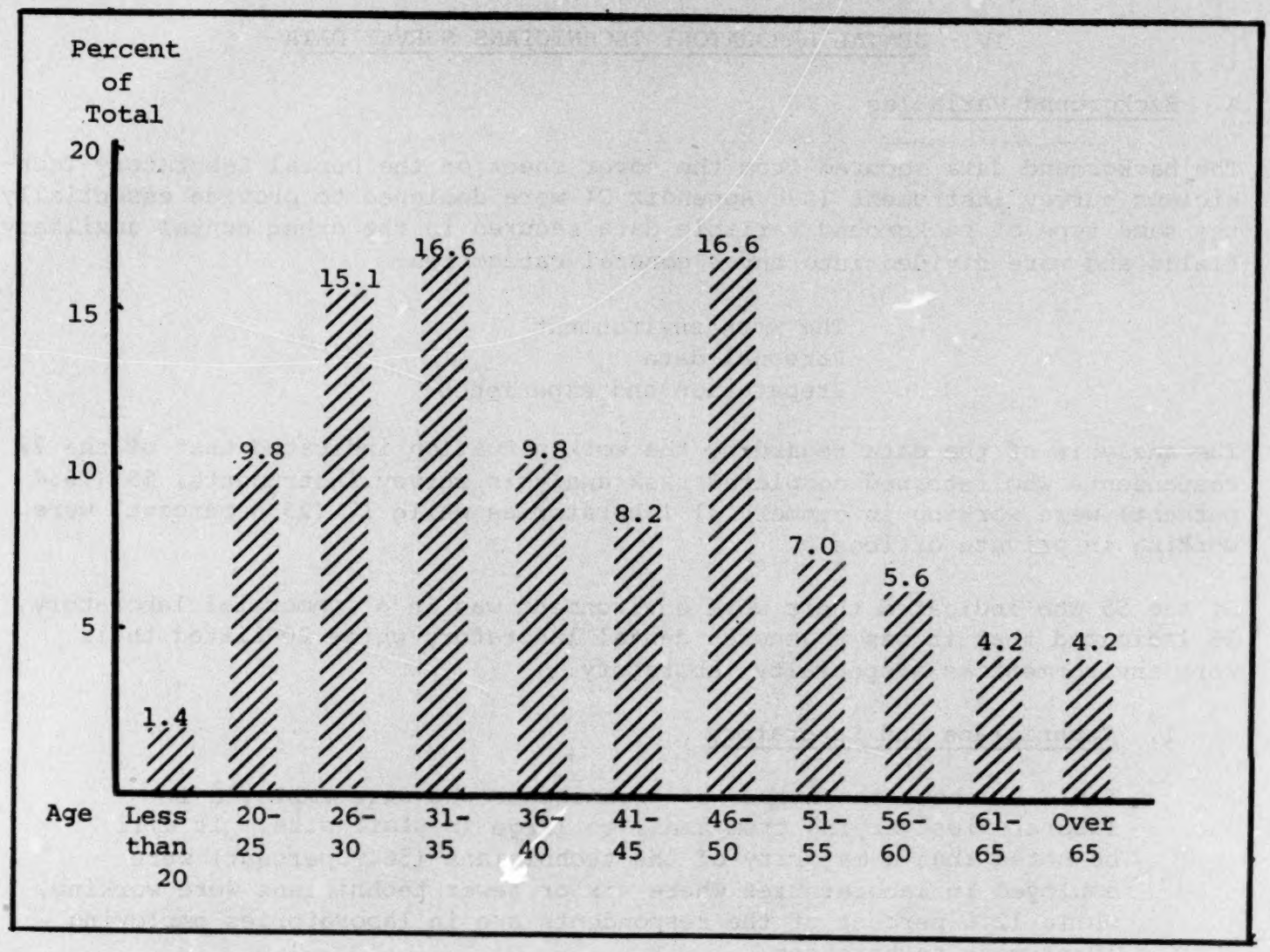
Table 11 shows the number of technicians who were employed in laboratories varying from small to large in staff size. It will be noted that a majority of the technicians (56.9 percent) were employed in laboratories where six or fewer technicians were working, while 12.6 percent of the respondents are in laboratories employing 10 or more technicians.

Table 11. Number of Technicians in Laboratory

Number of Technicians	1	2	3	4	5	6	8	9	10	12	13	14	20
Percent of Response	12.5	15.3	5.6	8.3	6.9	8.3	4.2	9.7	2.8	2.8	2.8	2.8	1.4

Figure 6 delineates the age range of the respondents in the Dental Laboratory Technology survey and shows a distribution from the youngest technician, age 19, to the oldest, age 79.

Figure 6. Age Distribution of Respondents



2. Monthly Salary

Respondents to the questionnaire were not required to answer the questions about salary information because it was not directly related to the development of curriculum or instructional material. As a result, only 32 of the respondents specified their monthly salaries. A breakdown of these responses is given in Table 12. It was the opinion of the project staff that insufficient numbers of responses were received regarding salary to allow for significant data analysis. The data in Table 12 are reported here merely for the reader's interest.

Table 12. Monthly Salary

Monthly Salary	Percent of Response
Less than 400	9.4
400-500	28.1
501-600	3.0
601-700	6.2
701-800	15.8
801-1000	18.7
More than 1,000	18.7

3. Type of Training

In response to the section of the cover sheet designed to assess the type of training received by Dental Laboratory Technicians, several of the respondents indicated experience in more than one type of training. (See Table 13.) Most of the multiple answere involved the manufacturers' training course which logically could have been taken by technicians whose initial training environments could have been any of the other options on the survey form. Of all of the individuals who responded, less than 23 percent indicated a formal training program in one-year or two-year college or trade-school programs.

Table 13. Type of Training

	OJT	Military	Manufacturers' Courses	One-Year School	Two-Year School
Yes	88.8	16.6	47.2	11.1	12.5
No	11.1	83.3	52.8	88.8	87.5

4. Major Responsibilities

Table 14 relates to the major responsibilities of the technicians involved in the survey. Also in this area are many indications of multiple answers wherein some individuals responded to general procedures. The smallest number of responses in specialty areas was 11 percent; these consider their major responsibilities to be orthodontic cases, but 19 percent of the total were responsible mainly for ceramics procedures. It was also interesting to note that 18 of the technicians returning survey forms (25 percent) were involved in supervisorial duties.

Table 14. Major Responsibilities

Reply	General	Full Dentures	Partial Dentures	Crown & Bridge	Ceramics	Ortho-dontics	Super-visor
YES	35	29	33	33	14	8	25%
NO	37	43	39	35	58	64	75%

5. Cross-Tabulation

The background data were combined in various ways in order to learn more about the respondents and their work situations. When background variables were cross-tabulated, type of laboratory vs. job type (i.e., generalist-specialist), none of the technicians who worked in private offices indicated specialty duties, but in the commercial laboratory, 19 indicated specialty in the commercial laboratory and 31 were generalists.

Other cross-tabulations were performed to determine if there were significant differences or trends in the background characteristics; e.g., the data resulting from responses about age were run to see if there were important differences as to their placement in private offices or commercial laboratories. Results were not significant, indicating that there are no substantial differences in age, regardless of the work environments.

A cross-tabulation was also done to determine if the years of experience would vary with the work situation. Once again, the results were not significant and showed little difference in the average work experience between private office technicians and commercial laboratory technicians.

The type of training was also considered, cross-tabulated with the work environment, and in no case did the reportable data suggest significant differences in the type of preparation regardless of the work environment.

Among all of the cross-tabulations, only three were significant. The salary level was compared with the work environment; the mean average monthly salary of those respondents who reported was $540. Monthly salary ranged between $300 and $900 for those working in private offices,

and in commercial laboratories, the average was slightly under $890, ranging from a low of $500 to a high of $1500. Further comparisons indicated no significant differences in salary whether the technicians were generalists or specialists. There was also no apparent difference in salary relevant to the type of training received.

Technicians in supervisory positions were earning an average monthly salary of $1100, greater than the average monthly income for all technicians.

Cross-tabulations were also done to determine possible differences between specialized areas of work and job preparation; once again they revealed no significant results. A cross-tabulation was then made to analyze training and background for those technicians working as supervisors, and here a significant trend was indicated: 42.5 percent of the supervisors participated in manufacturers' training courses, but only 33 percent of the general population of technicians had attended such courses.

B. Task Analysis

The analysis of data received from the actual task survey was carried out for Dental Laboratory Technicians in the same way as that described earlier for the Dental Assistants.

The following tables represent a rank order of tasks as reported by the Dental Laboratory Technician respondents.

C. Observations and Conclusions

The entire task list for Dental Laboratory Technology, consisting of 118 items, will be reported here since a small number of procedures (four tasks in all) fell below the line arbitrarily used in the Dental Assistant's task analysis representing tasks done by less than 3 percent of the respondents. The median line was drawn between item number 55, "Survey and design removable partial dentures" and item number 56, "Polish removable partial denture base."

Of the 25 tasks in the functional area entitled "Office Procedures," only four (16 percent) fell above the median line. They were "Receive and place telephone calls," "Order supplies," "Sort incoming mail," and "Verify invoices."

The dental laboratory functions were distributed evenly above and below the median line, with the most frequently reported task (77.8 percent of the respondents), "Pour, trim, and articulate casts."

ANALYSIS OF RESPONSES TO TASK SURVEY
BY FUNCTIONAL AREAS
(DENTAL LABORATORY TECHNICIANS)

Category Rank Order	Overall Rank Order	LABORATORY Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	1	Pour, trim, and articulate casts.	77.8	2.00	2.90
2	2	Interpret the dental prescription.	68.1	2.74	3.30
3	4	Give "on-the-job" instruction to subordinate personnel.	58.3	3.62	3.97
4	5	Clean and maintain laboratory instruments.	59.7	1.26	1.92
5	6	Maintain dental laboratory equipment.	75.0	1.96	2.57
6	7	Supervise subordinates in the laboratory.	50.0	3.53	3.74
7	8	Critically evaluate for processing errors.	50.0	3.23	3.74
8	9	Critically evaluate completed case.	48.6	3.40	3.87
9	10	Complete simple denture repairs.	54.2	2.27	3.15
10	11	Finish and polish gold alloy inlays, crowns, or fixed partial dentures.	51.4	2.25	3.61
11	12	Fabricate stone dies.	51.4	1.82	2.94
12	13	Design and form post dam.	51.4	2.63	3.43
13	14	Sprue, invest, and burn out gold alloy inlays, crowns, or pontics.	52.8	2.21	3.29
14	15	Cast gold crown, inlay or pontic backing.	47.2	2.35	3.38
15	16	Assemble and repair complete dentures.	51.4	2.61	3.49
16	17	Test occlusion and fit of inlays, crowns, or fixed partial dentures.	50.0	2.74	3.84
17	18	Critically evaluate impressions and casts prior to fabrication of cast.	45.8	3.32	3.79
18	19	Design and position palatal reliefs.	52.4	2.43	3.10
19	20	Care for preliminary or final impressions.	51.4	1.65	2.61
20	21	Pickle and heat treat gold inlays, crowns, or pontics.	47.2	1.63	2.53
21	22	Finish and polish complete dentures.	50.0	2.10	3.57
22	23	Remount complete dentures for occlusal.	47.2	2.17	3.14
23	25	Pour final impressions to produce master cast.	50.0	1.45	2.69
24	26	Wax-up and carve inlays, crowns, or pontics for fixed partial bridges.	51.4	3.06	4.43
25	27	Wax-up and contour complete base for try-in or final processing.	47.8	2.55	3.67
26	28	Flask, pack, cure, and deflask complete dentures.	48.6	2.31	3.35
28	30	Select artificial teeth for complete dentures.	41.7	3.27	3.97
29	31	Flask, pack, cure and deflask partial dentures.	51.4	2.22	3.30
30	32	Set up artificial teeth on removable partial denture framework.	48.6	3.54	4.13

Category Rank Order	Overall Rank Order	LABORATORY (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
31	33	Fabricate immediate complete or removable partial dentures.	44.4	3.35	4.19
32	34	Arrange artificial teeth in centric relation for complete dentures.	40.3	3.72	4.40
33	35	Complete complex denture repairs.	44.4	2.96	4.00
34	36	Eliminate wax from denture molds.	44.4	1.48	2.30
35	37	Select teeth for removable partial dentures.	44.4	3.00	3.61
36	38	Arrange artificial teeth in balance occlusion for complete dentures.	38.9	3.67	4.55
37	39	Grind in porcelain or acrylic facings and pontics.	54.4	2.59	3.83
38	40	Make trial baseplates and occlusal rims for removable partial dentures.	48.6	2.04	3.00
39	41	Fabricate impression trays from preliminary impressions.	47.2	1.90	2.93
40	42	Apply foil or tinfoil substitute to complete dentures.	41.7	1.30	2.13
41	43	Characterize denture base material.	44.4	2.38	3.46
42	44	Reline dentures by flask method.	48.6	2.52	3.35
43	45	Fabricate temporary removable partial dentures.	50.0	3.03	3.75
44	46	Bead and box complete or partial denture impressions.	38.9	1.41	2.87
45	47	Reline dentures by articulator method.	40.3	2.41	3.33
46	48	Burn out wax prior to casting.	34.7	1.50	2.48
47	49	Stabilize baseplates.	43.1	1.79	2.92
48	51	Wax-up, shape, and contour saddles for for try-in or final processing.	40.3	2.36	3.44
49	52	Remount removable partial denture prosthesis for occlusal adjustments.	38.9	2.04	3.04
50	53	Solder units of fixed partial dentures.	41.7	2.80	3.92
51	54	Store and inventory precious metals.	43.1	1.37	2.00
52	55	Fabricate copings.	40.3	2.23	3.14
53	56	Polish or glaze porcelain facings, teeth, or pontics.	37.5	1.83	3.28
54	57	Fabricate acrylic resin jacket crowns and pontics.	40.3	3.11	4.07
55	59	Survey and design removable partial dentures.	33.3	3.83	4.35
56	60	Polish removable partial denture base.	38.1	1.86	3.36
57	61	Estimate amounts of precious metals or chrome-cobalt alloys required for casting.	29.2	1.94	3.00
58	62	Duplicate master casts.	40.3	1.67	2.65
59	63	Grind in tube teeth or facings.	47.2	2.71	3.83
60	64	Fabricate individual surgical trays for immediate dentures.	44.4	2.07	3.04
61	65	Block out and relieve master casts.	31.9	2.06	3.30

Category Rank Order	Overall Rank Order	LABORATORY (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requipment
62	66	Pour refractory casts.	33.3	1.25	2.64
63	67	Survey and design study casts.	33.3	3.72	4.40
64	68	Adapt wrought gold clasps and bars.	37.5	3.04	4.17
65	70	Duplicate complete dentures.	43.1	2.71	3.69
66	71	Ditch the die.	26.4	2.50	3.56
67	72	Replace tube teeth or facings.	44.4	2.37	3.52
68	73	Fabricate artificial teeth for characterized dentures.	29.2	3.00	4.24
69	75	Fabricate broken stree or precision attachment bridges.	40.3	3.50	4.44
70	76	Solder component parts of removable partial denture.	33.3	2.95	3.95
71	77	Fabricate temporary removable bite raisers.	41.7	2.69	3.39
72	78	Wax-up components of frameworks for removable partial dentures.	23.6	2.79	3.93
73	79	Repair metal parts of removable partial dentures.	31.9	2.83	4.00
74	81	Fabricate baked porcelain-to-gold restorations	20.8	3.29	4.56
75	82	Fabricate orthodontic space maintainers or retainers.	33.3	2.74	3.74
76	83	Finish and polish metal partial denture frameworks.	26.4	1.93	3.38
77	84	Sprue and invest wax-up for casting removable partial dentures.	25.0	2.46	3.43
78	86	Trim and wax-dip refractory casts of removable partial dentures.	20.8	1.54	2.80
79	88	Characterize and apply stains to porcelain facings, crowns, and pontics.	22.2	3.67	4.27
80	89	Transfer design from master cast to refractory casts.	20.8	2.08	3.14
81	90	Cast metal framework for removable partial dentures.	18.4	1.64	3.25
82	91	Fabricate ceramic porcelain jackets.	16.7	3.46	4.64
83	92	Fabricate mouth guards.	36.1	2.10	3.00
84	95	Dehydrate refractory casts.	16.7	1.30	2.00
85	96	Fabricate electroformed dies.	18.1	2.93	2.16
86	98	Pour casts of orthodontic deformities.	15.3	1.70	2.58
87	99	Sandblast chrome castings.	13.9	1.30	2.33
88	101	Fabricate removable expansion appliances.	22.2	3.00	4.13
89	105	Fabricate splints for immobilization of fractures of maxilla and mandible.	23.6	3.53	4.31
90	106	Fabricate amalgam dies.	15.3	2.00	3.08
91	107	Fabricate cast metal bases for complete dentures.	20.8	3.18	4.00
92	110	Fabricate cleft palate obturators.	18.1	3.55	4.08
93	118	Fabricate face masks for before-and-after presentations of special cases.	1.4	2.00	5.00

DENTAL LABORATORY TECHNICIAN

Category Rank Order	Overall Rank Order	OFFICE PROCEDURES Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	3	Receive and place telephone calls.	63.9	1.51	1.77
2	24	Order supplies	59.7	1.89	2.21
3	50	Sort incoming mail	31.9	1.15	1.68
4	58	Verify invoices.	29.2	1.56	2.16
5	69	Perform housekeeping duties.	25.0	1.28	1.83
6	74	Maintain and rotate inventory.	38.9	1.68	2.24
7	80	Write checks and maintain balance.	25.0	1.81	2.31
8	85	Insure receipts.	16.7	1.33	2.18
9	87	Maintain appointment control.	13.8	1.50	2.56
10	93	Prepare correspondence.	22.2	2.43	2.73
11	94	Prepare bank deposits.	25.0	1.44	2.13
12	97	Maintain petty cash accounts.	16.7	1.55	2.31
13	100	Make ledger entries.	15.3	1.40	2.36
14	102	Prepare statements.	20.8	1.31	2.54
15	103	Maintain state and federal tax information.	19.4	2.33	2.92
16	104	Receive and dismiss patients and visitors.	9.7	2.00	2.29
17	108	Collect fees for dental services.	12.5	2.00	2.70
18	109	File business and patient records.	9.7	1.43	2.38
19	111	Maintain accurate patient dental records.	8.3	1.60	2.17
20	112	Reconcile bank statement.	19.4	2.25	2.54
21	113	Arrange financial agreements.	9.7	4.43	3.25
22	114	Prepare tax forms.	12.5	3.22	3.46
23	115	Assemble patient records for treatment.	12.5	1.50	2.67
24	116	Complete dental insurance forms.	2.3	3.00	3.00
25	117	Maintain an active recall system.	2.8	1.50	3.00

V. DENTAL HYGIENE DATA

A. Background Variables

The background data secured from the cover sheet of the Dental Hygiene survey instrument (Appendix C) were designed to provide (like the Dental Assistants and Dental Laboratory Technology surveys) three basic categories of information: 1) an analysis of the work environment, 2) personal information, and 3) the respondent's pre-service training and preparation.

An analysis of the data (shown in Figure 7) regarding the age of the respondents in the Dental Hygiene survey indicated that the largest percentage of respondents was within the age group 24-26. An analysis of this data indicates, in general, that the mean age for Dental Hygienists is a few years older than the Dental Assistants--not unexpected in view of the additional formal training required in the field of dental hygiene.

Figure 7. Age Distribution of Respondents

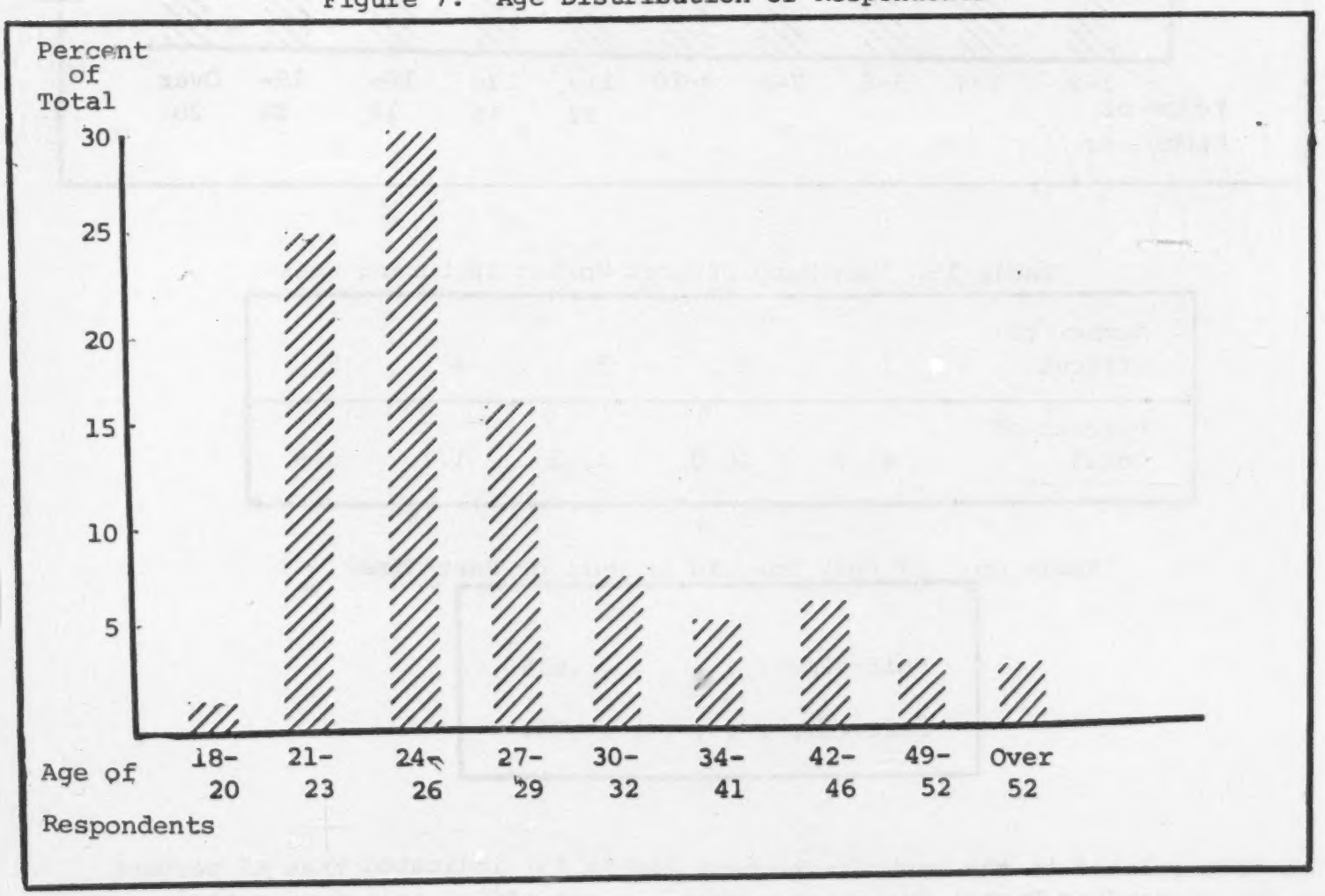


Figure 8 indicates that approximately 50% of the Dental Hygienists within this sample have had four years' experience or less; when combined with the age data shown in Figure 7, this indicates a significant turnover rate in the dental hygiene field.

Figure 8. Years of Experience as Dental Hygienist

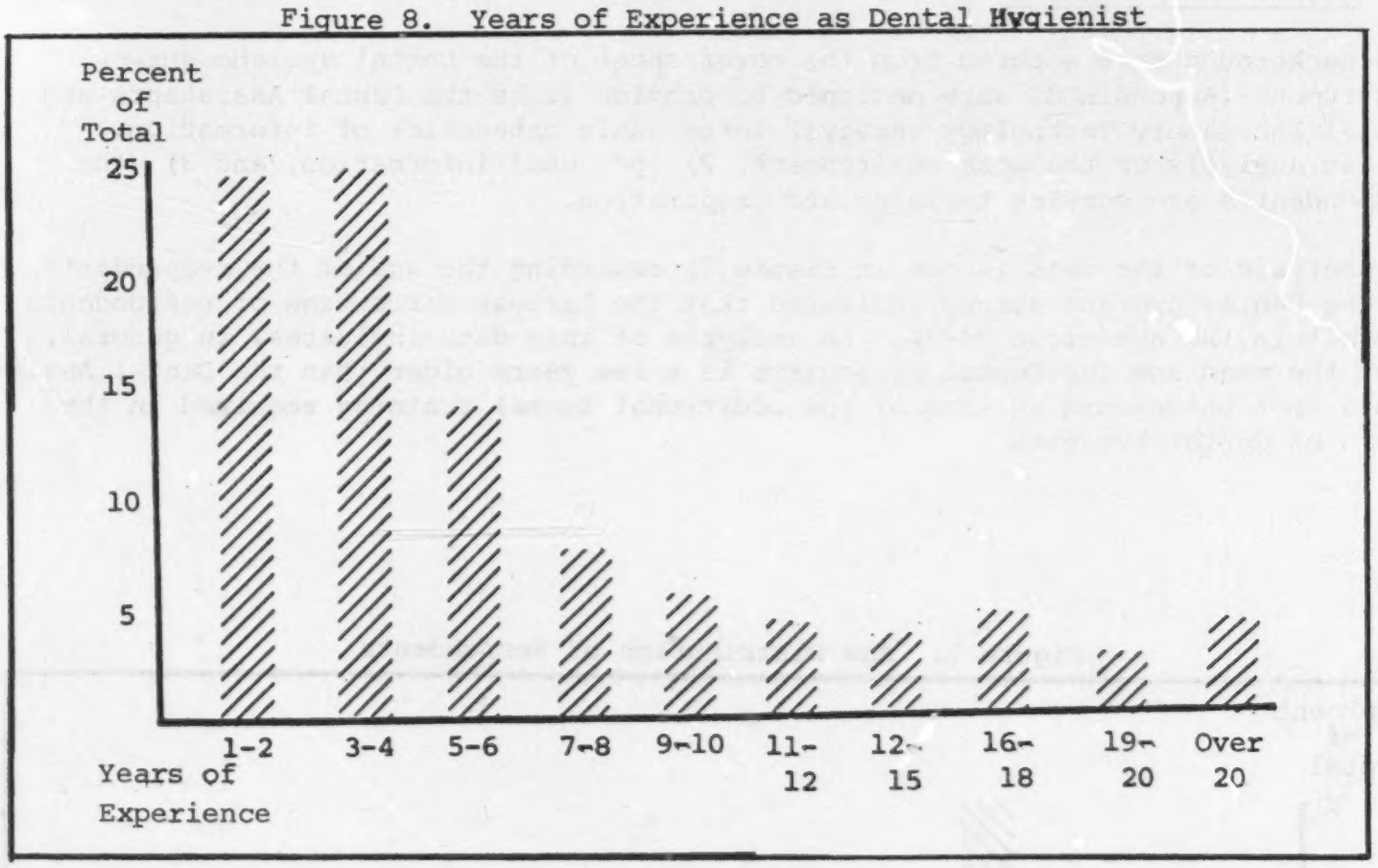


Table 15. How Many Offices Worked in During Week?

Number of Offices	1	2	3	4	5
Percent of Total	65.0	20.0	12.5	1.7	0.8

Table 16. If Only One, is it Full or Part-Time?

Full-time	.61%
Part-time	.39%

The data related to the work environment (Table 15) indicated that 65 percent of the responding Dental Hygienists worked in one office only during their week's activity, and Table 16 shows that of the 65 percent, 61 percent were considered full-time in that one office.

Table 17 reports the data with respect to number of operatories in the work environment of the Dental Hygienists in their office (where they reported working only in one office) or in their primary office when the Hygienist reported working in more than one office. It can be seen that approximately 54 percent of the Dental Hygienists reported that their only or primary office environment consisted of three or four operatories. This seems consistent with the recommendations of practice management specialists who indicated that when utilizing Dental Hygienists, maximum efficiency can be attained with three operatories or more.

Table 17. Number of Operatories in Only or Primary Office

Number of Operatories	Percent of Total
1	5.0
2	20.8
3	43.3
4	10.8
5	6.7
6	3.3
7	0.8
8	2.5
9	1.7
10 or more	4.8

Tables 18 and 19 report the data regarding the number of dentists and number of assistants in the single or primary dental office for responding Dental Hygienists; with the Dental Assistants, it is apparent that the predominant work environment involves a single dentist with multiple auxiliary personnel. 65 percent of the respondents were working in offices with a single dentist, and 72.5 percent of the offices employed two or more Dental Assistants.

Table 18. Number of Dentists in Only or Primary Office

Number of Dentists	1	2	3	4	5	6	8	9	12	13
Percent of Total	65.0	19.1	5.8	2.5	.8	.8	2.5	.8	.8	1.6

Table 19. Number of Assistants in Only or Primary Office

Number of Assistants	1	2	3	4	5	6	9	12	20
Percent of Total	27.5	39.2	17.5	3.3	3.3	1.6	2.5	.8	.8

Table 20 shows the breakdown of the type of practice and indicates that 90.8 percent of the Dental Hygienists were working in general offices with about 6 percent in a practice involving a periodontal specialist. Insufficient numbers were available to provide a significant breakdown of the other specialties reported by the respondents.

Table 20. Type of Practice in Only or Primary Office

Type	Percent of Total
General	90.8%
Periodontics	5.9
Other Specialties	3.3

The type of training reported by the Dental Hygienists (see Table 21) showed the majority (58.3 percent) of the respondents graduated from two-year college training programs and less than 1 percent receiving Master's degrees. It should be remembered, however, that the selection of respondents involved only private dental offices and hence would not allow for identification of Dental Hygienists working in large clinical, educational, or institutional situations where a higher percentage of four-year college and Master's degree graduates would be found. This listing of training background of Dental Hygienists does not represent a breakdown of training of all Dental Hygienists as a whole, but merely indicates the percentage of respondents within the survey sample itself.

Table 21. Type of Training

Type of Training	Percent of Response
Two-Year College	58.3
Four-Year College	26.7
Master's Degree	.8

Table 22 summarizes the monthly salary reported by Dental Hygienists. Because respondents were not required to answer this question, the entire 120 respondents are not represented in this table. Twenty-five respondents chose not to answer the question about salary, and thus the monthly salary table represents only 90 of the total survey responses.

Table 22. Monthly Salary

Salary	Percent of Response
$200 or less	5.0
201 - 300	3.3
301 - 400	2.5
401 - 500	4.2
501 - 600	15.0
601 - 700	7.5
701 - 800	8.3
801 - 900	5.0
901 - 1000	13.3
1001 or more	2.5

B. Task Analysis

The following tables report the task analysis data received from the Dental Hygienist's survey. As demonstrated in the Dental Assistant and Dental Laboratory Technician surveys, for each of the five functional categories the first column shows the order of procedures ranked according to frequency percentage of performance. The second column reports the order in which each task was ranked in the total (overall) list. The knowledge level and manual requirement columns refer to the mean values (on a scale of 5) which the responses assigned to each procedure.

Only those procedures reported by 3 percent or more of the respondents will be reported.

C. Observation and Conclusions

As indicated with respect to the Dental Assistant function list, only those procedures performed by 3 percent or more of the respondents were included in the final list to be analyzed. Most of the procedures which either were not performed by the Dental Hygienists or performed infrequently were laboratory functions. A few were part of the chairside assisting list: e.g., "Place gold foil as directed by operator," performed by 1.7 percent of the responding Dental Hygienists, and "Anneal gold foil," reported by 2.5 percent of the Dental Hygienists. One office procedure also fell below the 3 percent limit for Dental Hygienists. It was "Prepare tax forms," with 2.5 percent responding affirmatively.

There were 172 functions on the task list that were performed by 3 percent or more of the Dental Hygiene respondents. A median line was drawn between function line #86, "Change engine belt on low-speed engine" and #87, "Mix solutions for developing and fixing radiographic film." The distribution of the 172 functions relative to the median line in each of the categories is reported in Table 23.

Table 23. Dental Hygiene Distribution of Tasks

	No. of Functions in Survey	No. Above Median	Percentage Above Median	No. Below Median	Percentage Below Median
X-Ray	21	16	76	5	24
Office	24	12	50	12	50
Chairside	70	24	34	46	66
Hygiene	44	35	80	9	20
Laboratory	14	0	0	14	100

Of the 21 functions listed in X-ray category No. 16, 76 percent were found above the median while only five (24 percent) were below. As a general rule, a higher percentage of Dental Hygienists reported affirmatively for most X-ray functions than Dental Assistants: e.g., the function "Apply bite-wing radiographic procedures" for the Dental Assistants occupied position No. 55 from the top of the ranking order and was performed by 47.1 percent of the Dental Assistants in the survey. For the Dental Hygienists this procedure occupied the No. 16 position from the top and was recorded affirmatively by 85.8 percent. A more extensive comparison of the responses among the three dental auxiliaries will be covered in Section 5 of this report.

Of the 24 office procedures listed in the survey, 50 percent were above and 50 percent below the median line for Dental Hygienists. The highest ranking office procedure was "Receive and dismiss patients and visitors," reported by 85 percent of the Dental Hygienists, followed by "Maintain accurate patient dental records," reported by 80.8 percent. Other procedures above the median line involved general housekeeping, telephone, and patient records (including recall systems), while below the median were generally the office procedures relating to correspondence, financial procedures and insurance forms.

Of the chairside procedures on the list, 66 percent or 46 procedures of the 70 within the total fell below the median line for Dental Hygienists, with 24 procedures (34 percent) being above the median. Most of the procedures above the median in the chairside listing reported by Dental Hygienists involved those procedures directly related to the prophylaxis they performed, and do not appear to be related to chairside assisting. Only 21.7 percent responded affirmatively to the procedure "Deliver and receive instruments at chairside," which placed this procedure No. 85 from the top of the list, just one above the median. Other procedures in the chairside list typically related to assisting the dentists (such as "Apply air to keep cavity preparation dry" and "Assist with oral surgery procedures") were performed by 10.8 percent and 12.5 percent, respectively, by respondents in the dental hygiene sample.

Of the 44 dental hygiene functions, 80 percent or 35 procedures were above the median while nine procedures (20 percent) fell below. An analysis of those nine functions falling below the median for dental hygiene indicates that the majority can be considered "expanded functions" such as "Smooth enamel fractures" (21.7 percent), "Remove sutures" (20 percent), "Remove surgical periodontal packs" (10 percent) and "Give physiotherapy instructions for temporomandibular joint difficulty," which was performed by 5.8 percent of the responding Dental Hygienists.

In the category of dental laboratory procedures, there were no functions reported with sufficient frequency to be listed above the median line. Only 14 procedures in the total dental laboratory list were performed by more than 3 percent of the Dental Hygienists and many of those related merely to maintenance and housekeeping duties in the laboratory, and were not considered dental laboratory functions per se. The procedure that was reported by the highest percentage as being part of their routine duties was "pour, trim, and articulate casts," 6.7 percent of the Dental Hygienists. As in the case of the Dental Assistant, procedures involving the carving, casting and polishing inlays and crowns were very low on the list. The procedure "Wax-up and carve inlays and crowns" in the dental hygiene list was No. 172, occupying the last position as reported by 3.3 percent of the Dental Hygienists; the gold-casting procedures were reported by 4.2 percent.

Considering the low percentage of laboratory procedures performed by Dental Hygienists (like Dental Assistants), it would be difficult to justify incorporating into the dental hygiene curriculum more than minimal procedures involving the pouring and trimming of dental casts.

ANALYSIS OF RESPONSE TO TASK SURVEY BY FUNCTIONAL AREAS
DENTAL HYGIENIST

Category Rank Order	Overall Rank Order	X-RAY Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	15	Practice patient and operator safety measures for X-radiation.	88.9	1.43	1.84
2	16	Apply bite-wing radiographic procedures.	88.9	2.46	3.32
3	18	Select film size appropriate for patient's mouth and indicated technique.	88.9	2.07	2.09
4	19	Position patient for radiographic examination.	85.7	1.74	2.36
5	23	Develop and fix exposed radiographic film.	82.5	1.58	2.22
6	31	Apply bisecting angle (short cone) procedures for peri-apical radiographic.	81.0	2.71	3.61
7	37	Evaluate dental radiographs for diagnostic quality.	57.1	2.89	3.27
8	38	Label dental radiographs.	65.1	1.22	1.63
9	42	Mount dental radiographs.	74.6	1.62	2.37
10	43	Adjust voltage, amperage, and timer of X-ray machine.	65.1	2.15	1.68
11	44	Select accessories for radiographic (X-ray) technique.	63.5	2.03	2.16
12	55	Maintain unexposed radiographic film storage.	49.2	1.25	1.39
13	60	File dental radiographs.	46.0	1.07	1.63
14	69	Apply paralleling (long cone) procedures for peri-apical radiographic survey.	34.9	2.65	3.44
15	76	Apply occlusal radiographic procedures.	46.0	2.53	3.23
16	83	Clean X-ray processing equipment.	36.5	1.22	1.63
17	87	Mix solutions for developing and fixing radiographic film.	31.7	1.43	1.86
18	91	Operate automatic processing equipment.	19.0	1.17	1.67
19	93	Apply extraoral radiographic procedures.	14.3	2.44	3.22
20	94	Supervise subordinates in operating dental X-ray equipment.	20.6	2.85	2.83
21	140	Apply panoramic radiographic procedures.	4.8	2.00	3.50

DENTAL HYGIENIST

Category Rank Order	Overall Rank Order	OFFICE Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	13	Receive and dismiss patients and visitors.	82.5	1.29	1.76
2	17	Maintain accurate patient dental records.	81.0	1.75	2.26
3	39	Perform housekeeping duties.	71.4	1.13	1.60
4	41	Maintain an active recall system.	60.3	2.11	2.03
5	45	Receive and place telephone calls.	58.7	1.68	1.83
6	58	Maintain appointment control.	36.5	2.13	2.19
7	59	File business and patient records.	49.2	1.13	1.57
8	64	Assemble patient records for treatment.	41.3	1.04	1.71
9	71	Issue receipts.	47.6	1.17	1.74
10	77	Make ledger entries.	28.6	1.37	1.88
11	79	Collect fees for dental services.	34.9	1.46	1.86
12	81	Order supplies.	44.4	1.61	1.73
13	103	Maintain and rotate inventory.	12.7	1.63	1.75
14	107	Sort incoming mail.	7.9	1.40	1.60
15	110	Verify invoices.	12.7	1.38	1.63
16	112	Prepare correspondence.	14.3	2.44	2.22
17	137	Maintain petty cash accounts.	6.3	1.25	1.75
18	145	Complete dental insurance forms.	7.9	2.20	2.40
19	150	Maintain state and federal tax information.	4.8	2.00	2.33
20	155	Write checks and maintain balance.	6.3	1.50	2.00
21	156	Prepare statements.	11.1	1.14	1.71
22	161	Reconcile bank statement.	6.3	1.50	2.00
23	162	Prepare bank deposits.	6.3	1.50	2.00
24	163	Arrange financial agreements.	6.3	3.50	2.75

DENTAL HYGIENIST

Category Rank Order	Overall Rank Order	CHAIRSIDE FUNCTIONS Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	7	Seat and dismiss patient from chair.	92.1	1.19	1.77
2	9	Prepare setup for prophylaxis (cleaning).	92.1	1.48	2.03
3	11	Instruct patient in Oral Hygiene.	92.1	3.72	2.87
4	20	Prepare and chemically disinfect instruments.	73.0	1.61	2.09
5	21	Maintain chain of antisepsis.	76.2	1.81	2.19
6	22	Prepare setup for fluoride treatment.	90.5	1.44	2.07
7	24	Care for various pieces of dental equipment.	85.7	1.63	2.49
8	26	Record oral conditions as directed by dentist.	79.4	1.56	2.18
9	30	Clean operatories and equipment.	74.6	1.17	1.92
10	34	Recognize various types of dental equipment.	66.7	1.40	2.17
11	40	Irrigate oral cavity for rinsing.	63.5	1.28	2.37
12	46	Examine and sharpen instruments as required.	85.7	1.87	3.33
13	52	Identify various types of dental instruments.	49.2	1.41	2.26
14	56	Prepare instruments for and operate autoclave.	44.4	1.61	2.11
15	62	Retract patient's cheek, lips and tongue.	46.0	1.55	2.93
16	65	Explain postoperative instruction to patient.	44.4	2.86	2.35
17	67	Insert or remove cotton rolls	41.3	1.50	2.73
18	72	Make proper disposition and distribution of medical or dental records.	25.4	1.56	1.81
19	75	Apply topical anesthetics.	52.4	2.39	2.91
20	78	Stabilize patient's mandible during operation.	27.0	1.38	2.47
21	80	Remove excess cement from crowns of the teeth.	38.1	2.46	4.08
22	84	Prepare setup for periodontal treatments.	28.6	1.44	2.33
23	85	Deliver and receive instruments at chairside.	23.8	1.20	2.87
24	86	Change engine belt on low speed engine.	49.2	1.42	2.40
25	89	Prepare setup for local anesthetic injection.	14.3	1.44	2.22
26	90	Assist with first aid procedures.	31.7	3.55	3.25
27	95	Prepare instruments for and operate dry-heat sterilizer.	12.7	1.75	2.13
28	96	Assist with amalgam restorations.	17.5	2.18	3.00
29	97	Dispense medications when ordered by dentist.	22.2	1.33	1.86
30	98	Prepare alginate for impression by dentist.	19.0	1.50	2.58
31	100	Take impressions for study models.	27.0	2.71	4.00

Category Rank Order	Overall Rank Order	CHAIRSIDE FUNCTIONS (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
32	101	Assist with the administration of local anesthetic.	12.7	1.38	2.38
33	102	Remove impressions from patient's mouth.	22.2	1.79	3.15
34	104	Fill alginate tray.	20.6	1.39	2.08
35	105	Remove periodontal surgical pack.	7.9	2.75	4.00
36	108	Prepare dental materials for placement.	11.1	1.57	2.71
37	109	Triturate amalgam-alloy.	14.3	1.67	2.53
38	113	Remove temporary cement.	11.1	2.57	4.43
39	114	Prepare rubber base material for impression.	9.5	2.00	2.67
40	116	Prepare acrylic for restoration.	7.9	2.00	2.40
41	117	Evacuate oral cavity during restorative procedure.	20.6	1.31	2.77
42	118	Apply water to tooth during cavity preparation.	9.5	1.17	2.67
43	119	Load carrier and place amalgam in cavity preparation.	11.1	1.71	3.14
44	120	Place periodontal surgical pack.	6.3	3.25	4.25
45	121	Prepare silicate for restoration.	12.7	2.00	2.75
46	122	Remove medication (dry socket).	1.6	3.00	3.00
47	123	Assist with gold foil restoration.	1.6	2.00	3.00
48	125	Retract oral tissues in surgical procedures.	14.3	1.78	3.33
49	126	Aspirate during oral surgery.	17.5	1.36	3.00
50	127	Hold impression in mouth after dentist places impression tray.	12.7	1.38	1.89
51	128	Prepare zinc phosphate cement for protective base.	12.7	1.75	2.88
52	129	Apply coagulants or administer hemostatics.	3.2	2.50	4.00
53	130	Apply air to keep cavity preparation dry.	14.3	1.11	2.78
54	131	Cut and remove sutures postoperatively.	12.7	2.00	3.50
55	133	Prepare hydrocolloid for impression	3.2	2.50	2.00
56	135	Assist with oral surgery procedures.	15.9	2.00	3.30
57	136	Cut suture material after it is tied by the dentist.	7.9	1.40	3.00
58	139	Place temporary cement.	9.5	1.67	3.50
59	142	Prepare setup for endodontics (root canal therapy).	7.9	2.60	1.07
60	144	Place matrix for amalgam restoration.			
61	147	Remove rubber dam.	3.2	2.00	3.00
62	148	Assist dentist in hospital operative procedures.			

Category Rank Order	Overall Rank Order	CHAIRSIDE FUNCTIONS (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
63	149	Prepare non-carpule hypodermic syringe for injection of medications.	3.2	1.00	2.50
64	151	Prepare setup for prosthetics.	6.3	1.75	2.75
65	152	Assist with rubber dam application and removal.	6.3	1.75	3.00
66	153	Prepare compound for impression by dentist.	9.5	1.83	2.50
67	154	Heat or prepare gutta percha for temporary stopping.	4.8	1.50	3.00
68	157	Condense amalgam restorations.	1.6	1.00	2.00
69	167	Prepare try setup for orthodontic treatments.	4.8	2.00	2.67

DENTAL HYGIENIST

Category Rank Order	Overall Rank Order	HYGIENE FUNCTIONS Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	1	Remove plaque and stain, and polish teeth.	98.4	2.92	4.25
2	2	Greet patient and escort him to dental hygiene operatory.	100.0	1.13	1.49
3	3	Give home care instruction.	100.0	3.30	2.97
4	4	Position patient and operator.	93.7	1.29	2.03
5	5	Clean interproximal surfaces of teeth with dental floss or tape.	100.0	2.30	3.79
6	6	Remove subgingival calculus.	96.8	3.16	4.76
7	8	Remove supragingival calculus.	95.2	3.09	4.61
8	10	Select appropriate home care technique for each patient.	95.2	3.73	3.08
9	12	Locate and assess the amount of stains and deposits.	96.8	2.71	3.58
10	14	Perform dental charting.	88.9	2.34	2.83
11	25	Maintain chain of antisepsis.	74.6	1.77	2.18
12	27	Recognize conditions indicated in history that require alteration procedure.	90.5	3.40	2.85
13	28	Clean and polish removable appliances.	84.1	2.02	3.11
14	29	Evaluate dietary habits and instruct patient on proper nutrition.	81.0	3.69	3.04
15	32	Identify abnormalities in soft tissues of the mouth.	82.5	3.56	3.44
16	33	Take and record patient's medical and dental history.	71.4	1.98	2.32
17	35	Sharpen instruments.	90.5	1.90	3.38
18	36	Use ultrasonic devices to remove calculus.	76.2	3.00	4.41
19	47	Apply disclosing solutions to the teeth to identify bacterial plaque.	65.1	2.07	3.02
20	48	Appy fluoride to teeth using the tray technique.	65.1	2.20	3.28
21	49	Plan sequence of procedures for appointment or series of appointments.	50.8	2.48	2.36
22	50	Polish finished restorations.	60.3	2.61	4.03
23	51	Apply fluoride to teeth isolated with cotton rolls.	61.9	2.40	3.69
24	53	Identify extra-oral habits affecting occlusion.	47.6	3.50	3.19
25	54	Give oral habit therapy.	46.0	3.46	3.39
26	57	Perform periodontal charting.	50.8	2.71	3.37
27	61	Perform root planning procedures.	50.8	3.38	4.91
28	63	Desensitize hypersensitive teeth.	55.6	2.74	3.44
29	66	Identify deviate swallowing patterns.	42.9	3.41	3.36
30	68	Administer anesthetics (topical).	57.1	2.54	2.89
31	70	Apply topical medications.	41.3	2.56	2.84

Category Rank Order	Overall Rank Order	HYGIENE FUNCTIONS (continued) Task Name	Percent Reporting	Knowledge Level	Manual Requirement
32	73	Perform soft tissue curettage.	33.3	3.48	4.86
33	74	Remove overhanging margins of fillings.	34.9	3.27	4.52
34	80	Remove excess cement from crowns of the teeth.	38.1	2.46	4.08
35	82	Supervise other dental auxiliaries in routine dental tasks.	25.4	2.71	2.93
36	88	Apply fluoride using ionizing devices.	20.6	2.39	3.54
37	99	Smooth enamel fractures.	22.2	2.93	4.08
38	111	Remove sutures.	17.5	2.00	3.50
39	124	Apply surgical periodontal packs.	4.8	2.67	3.50
40	132	Remove and insert temporary fillings.	7.9	2.40	4.00
41	134	Remove surgical periodontal packs.	4.8	2.67	4.00
42	141	Prepare surgical periodontal packs.	11.1	2.29	3.00
43	169	Give physiotherapy instruction for temporo-mandibular joint difficulty.	4.8	3.33	4.50
44	170	Perform bedside oral prophylaxis.	3.2	3.50	5.00

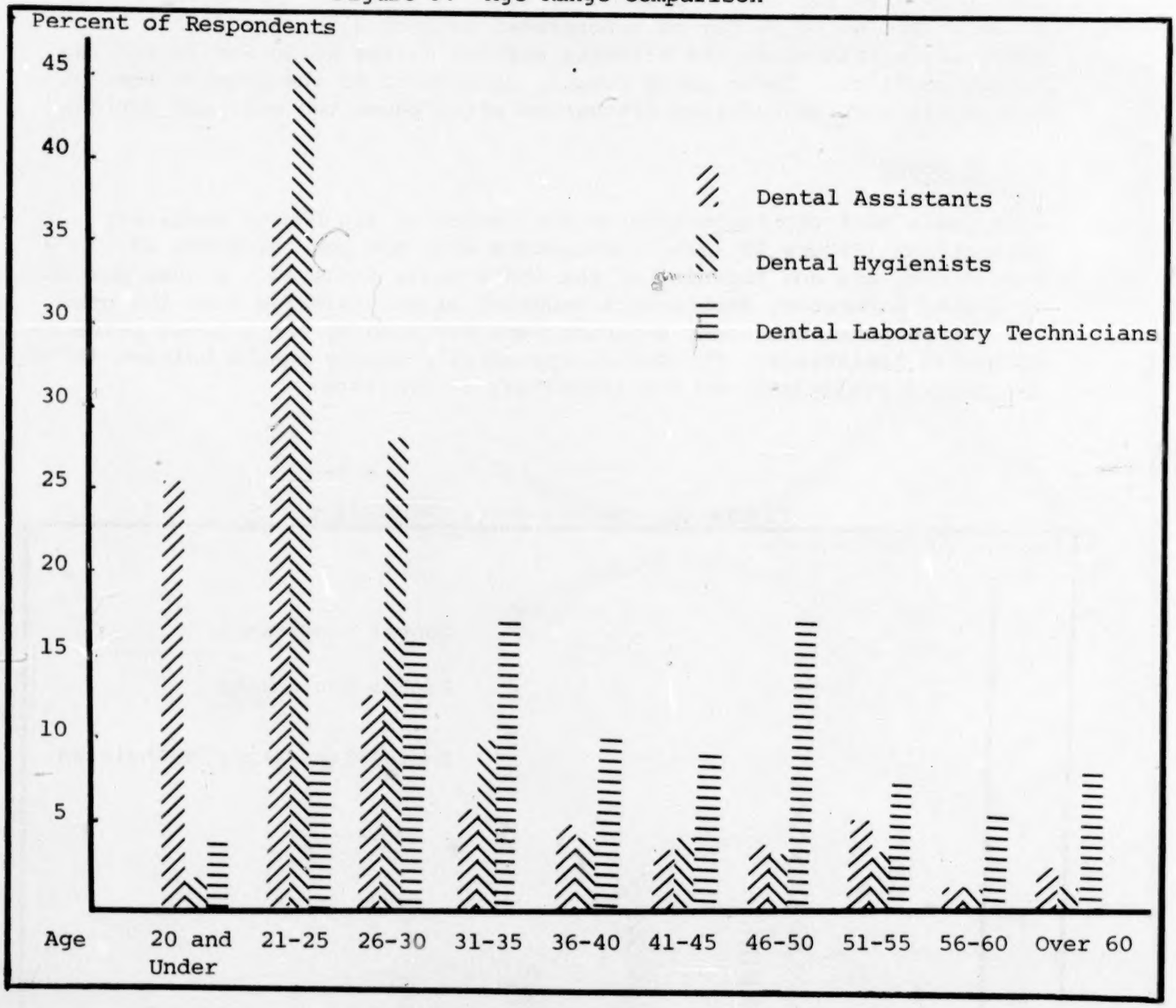
Category Rank Order	Overall Rank Order	LABORATORY Task Name	Percent Reporting	Knowledge Level	Manual Requirement
1	92	Clean and maintain laboratory instruments.	14.3	1.33	2.00
2	106	Maintain dental laboratory equipment.	12.7	1.38	2.25
3	115	Give "on-the-job" instruction to sub-ordinate personnel.	14.3	3.38	2.67
4	138	Arrange artificial teeth in centric relation for complete dentures.	11.7	3.49	3.62
5	143	Ditch the die.	5.0	3.29	2.98
6	146	Pour, trim, and articulate casts.	7.9	2.20	3.40
7	158	Fabricate baked porcelain-to-gold restorations.	4.2	3.45	3.61
8	159	Store and inventory precious metals.	6.3	1.67	2.00
9	160	Pour casts of orthodontic deformities.	3.2	2.50	4.00
10	164	Fabricate splints for immobilization of fractures of maxilla and mandible.	1.6	2.00	4.00
11	165	Finish and polish gold alloy inlays, crowns or fixed partial dentures.	4.2	2.64	3.12
12	166	Polish removable partial denture base.	3.2	2.00	4.00
13	168	Fabricate ceramic porcelain jackets.	3.3	3.42	4.00
14	172	Wax-up and carve inlays, crowns or pontics for fixed partial bridges.	3.3	3.52	4.00

VI. SUMMARY AND CONCLUSIONS

A. Background Variables

In order to facilitate the comparison of background data secured from the three occupational areas, the responses to commonly asked questions are delineated in the following charts and associated text.

Figure 9. Age Range Comparison



1. Age Range

A comparison among age data (Figure 9) shows that for both Dental Assistants and Dental Hygienists, the highest percentage were between the ages of 21 and 25, whereas 25 percent of the Dental Assistants and only 2 percent of the Dental Hygienists were 20 years of age or younger. In each of the groups between 21 and 35, higher percentages of the Dental Hygienists reported than Dental Assistants; beyond age 36, insignificant differences

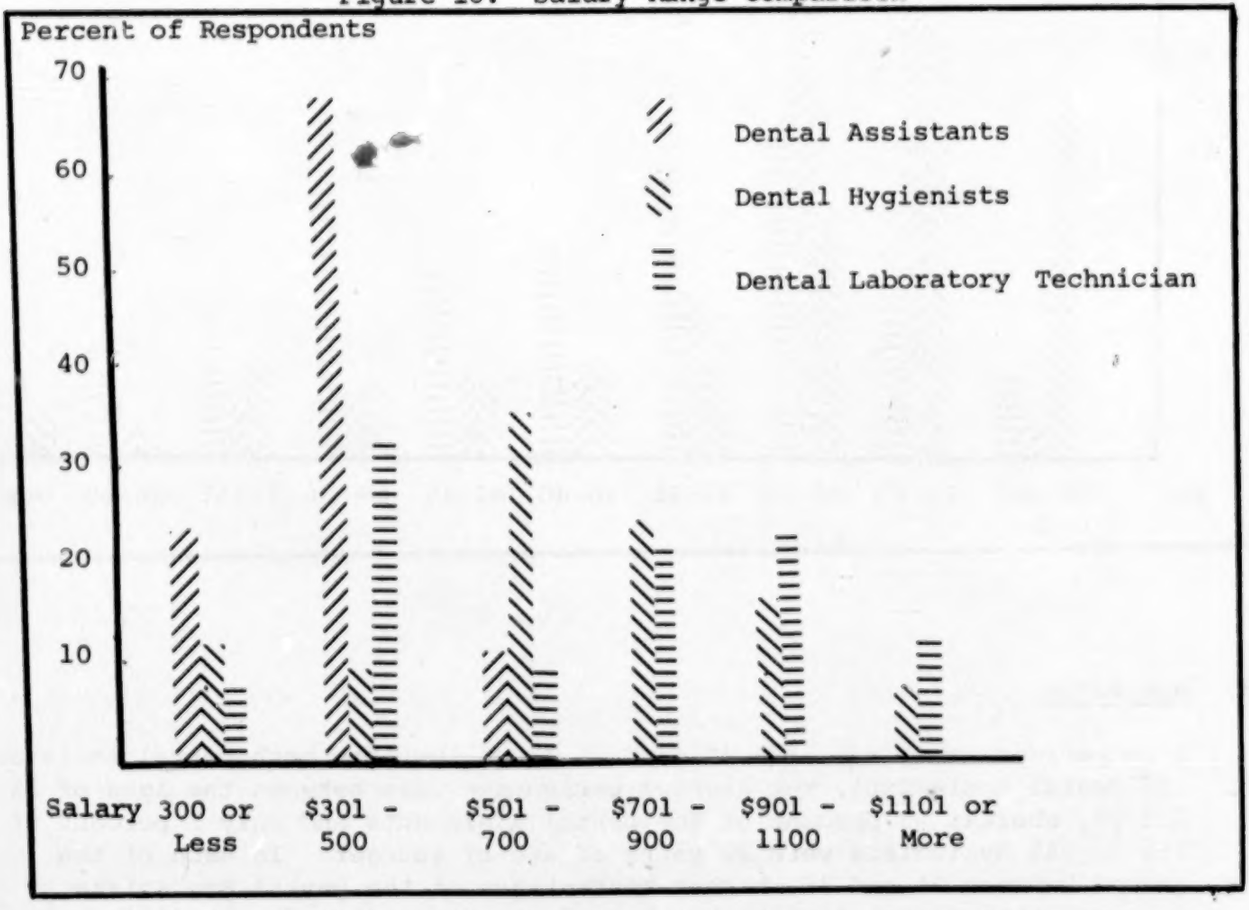
appeared. In view of the necessity for two years or more of formal training for Dental Hygienists (which was not reported by the large majority of the Dental Assistants, who received only on-the-job training), these responses were not surprising.

When comparing the above data with the age responses for Dental Laboratory Technicians, a far more stable and generally older pattern is observed for technicians; most of them are males and will remain in the dental auxiliary area for longer periods of time. The peaks that occur at ages 31 to 35 and 46 to 50 may be interpreted as including many Dental Laboratory Technicians trained in the military service during World War II and the Korean conflict. These peaks roughly correspond to the present ages of former military technicians discharged after those two military actions.

2. Salary Range

It appears that the respective salary ranges of the Dental Auxiliary occupations (Figure 10) are commensurate with the general years of experience, age and training of the individuals involved. Higher percentages of Dental Laboratory Technicians reported higher salaries than the other two occupations; the lower salaries were reported by the highest percentage of Dental Assistants. The Dental Hygienist's salary ranged between those of the Dental Assistants and the Laboratory Technicians.

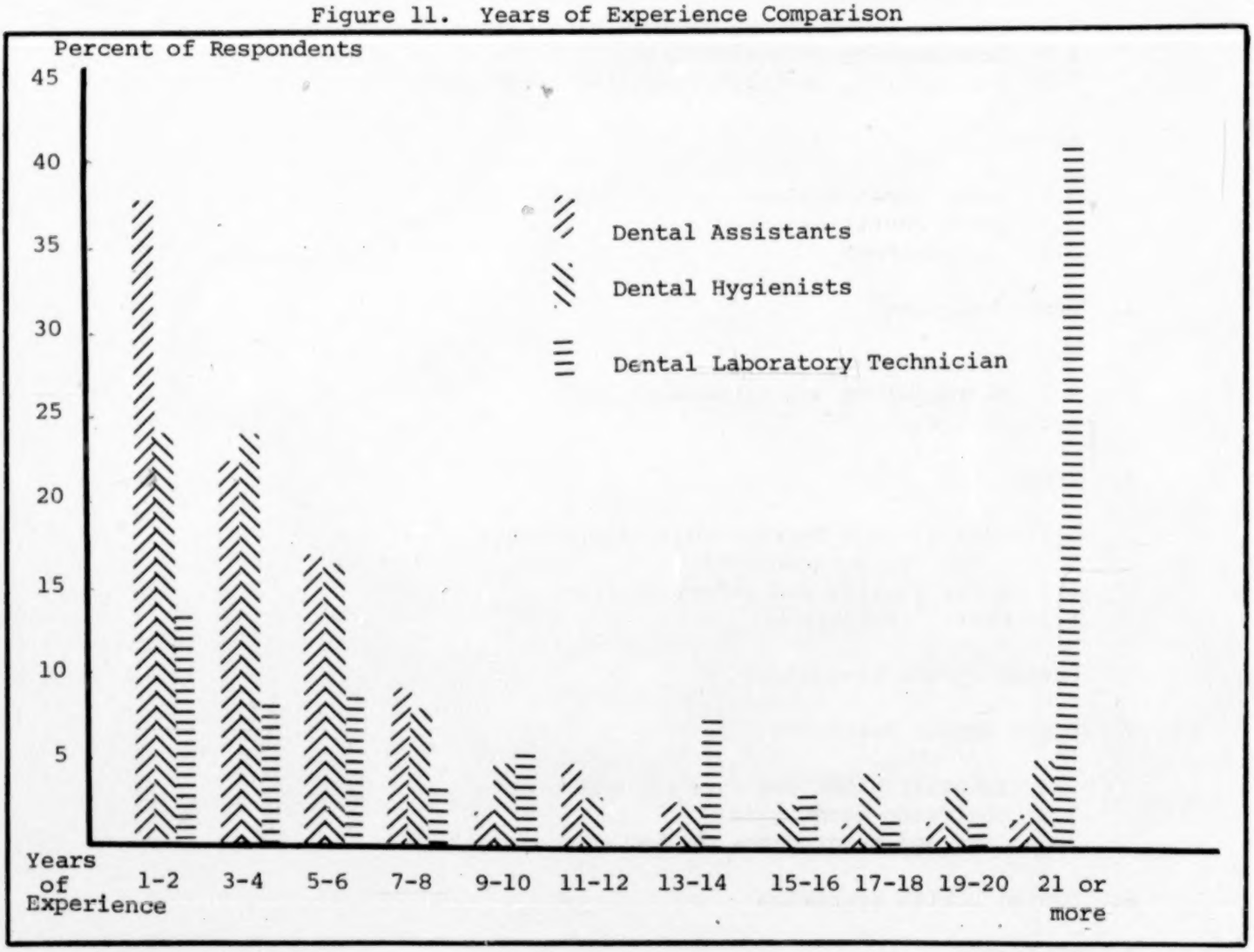
Figure 10. Salary Range Comparison



3. Years of Experience

Data on years of experience were compared (Figure 11); 37 percent of the Dental Assistants and 24 percent of the Dental Hygienists had less than two years' experience on the job, but only 13.5 percent of the Dental Laboratory Technicians have been working less than two years. This chart indicates that generally the Dental Assistant has less experience and therefore a higher turnover rate than the Dental Hygienist, who in turn has a higher turnover rate than the more stable Dental Laboratory Technician. It will be noted that the largest percentage of response for Dental Laboratory Technology (42 percent) was from technicians with 21 years of experience or more, whereas only 5 percent of the Dental Hygienists and only 1 percent of the Assistants were in this category.

Figure 11. Years of Experience Comparison



B. Application of Survey Data in Curriculum Construction

The preceding interim reports of the AHPP Dental Auxiliary staff suggested an instructional format for the curriculum units which is being followed by the Project staff. It includes the following:

Dental Auxiliary Curriculum Units

1. Orientation

   1.1 Survey and ethics of health field
   1.2 History and organization of dental sciences

2. Basic Laboratory

   2.1 Pouring and trimming of models
   2.2 Construction of custom trays
   2.3 Wax carving, investing, casting techniques

3. Anatomy

   3.1 Basic human biology
   3.2 Basic dental anatomy
   3.3 Oral anatomy

4. Basic Sciences

   4.1 Human biology
   4.2 Microbiology and asepsis
   4.3 Oral biology

5. X-Ray

   5.1 Creating and developing a latent image: dark-room techniques
   5.2 X-ray physics and safety factors
   5.3 Dental radiography

6. Dental Office Procedures

7. Basic Dental Assisting

   7.1 Identification and care of instruments
   7.2 Chairside techniques
   7.3 Care and maintenance of dental equipment

8. Dental health education

9. Chairside

10. Expanded functions for Dental Assistants*

11. Advanced pre-clinical basic sciences

12. Dental prophylaxis techniques

13. Preventive procedures

    13.1 Topical fluoride application
    13.2 Advanced functions for Dental Hygienists

14. Expanded functions for Dental Hygienists*

15. Full denture construction

16. Partial denture construction

17. Advanced gold lab procedures

18. Ceramics

    18.1 Porcelain
    18.2 Gold-porcelain bonded

These instructional units encompass concepts and skills required for performance in the entire dental auxiliary functional area. Individual curricula will be assembled by selecting instructional units applying to each specific field. A graphic example of how these can be used in multiple programs is seen in Figure 12. Although many units are highly conceptual, as opposed to being task-oriented (the content of which is determined via a variety of input sources), the task analysis data help to determine placement of procedural instruction in core, sub-core or specific training areas.

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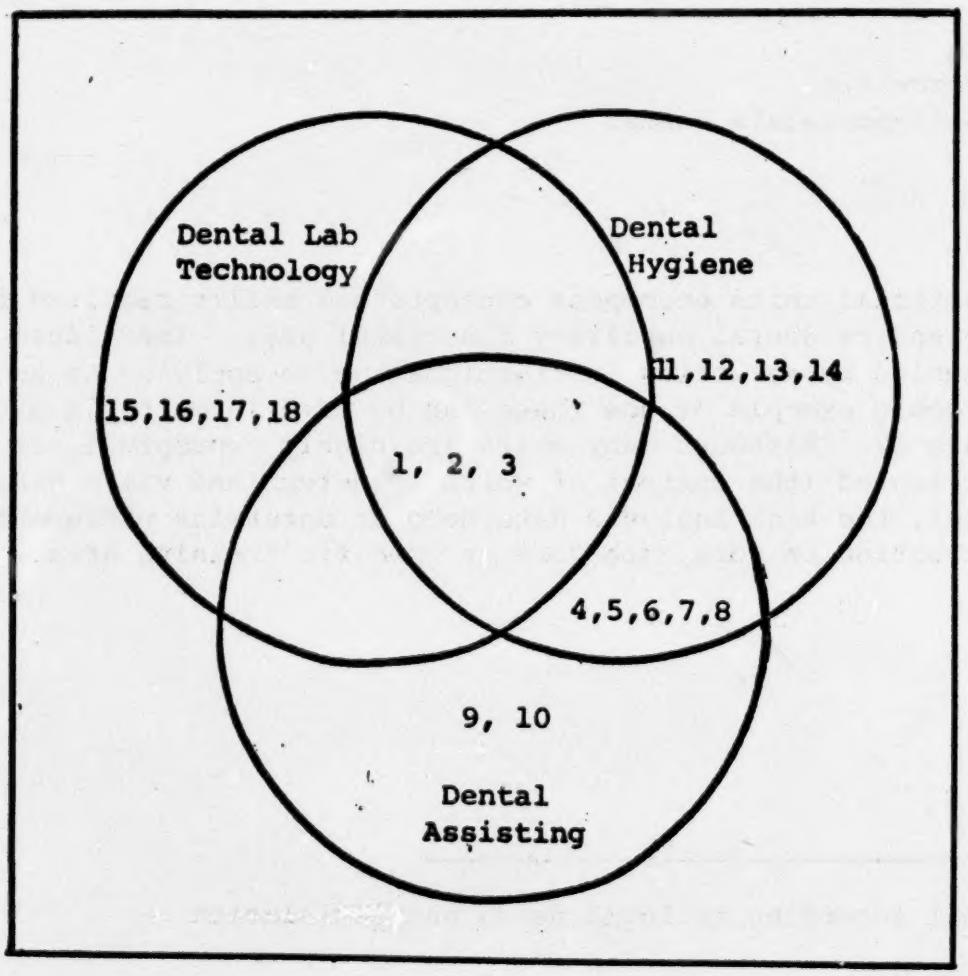
* Optional according to local needs and legislation

Figure 12 demonstrates that Units 1, 2, and 3 include the basic concepts common to all three Dental Auxiliary occupations. These constitute a sub-core curriculum for the dental field. Curriculum units 4, 5, 6, 7, and 8 provide the Dental Assistant and Dental Hygienist with common concepts relating equally to both curricula. Instructional units 9 through 18 contain specific concepts and skills applying only to the specialized duties of each occupation.

Figure 12. Common Use of Dental Auxiliary Curriculum Units



Core Curriculum Procedures

Many approaches to core curriculum in the Dental Auxiliary occupations have emphasized dental laboratory procedures. In Dental Assistant and Dental Hygiene training programs, many hours are devoted to the carving and waxing of crowns and inlays, their investing, casting and polishing. Denture repairs are also taught, as well as the fabrication of bite rims and bite blocks. In view of the amount of time required to teach these procedures adequately, inclusion in a core curriculum for all three Dental Auxiliary occupations seems questionable (relative to the present delivery system). While approximately 52 percent of the Dental Laboratory Technicians in the survey were involved in techniques for fabrication of cast gold restorations, only 6 percent of the Dental Assistants and 2.5 percent of the Dental Hygienists reported these procedures as part of their daily routine. Whereas 52.8 percent of the Dental Laboratory Technicians reported the task "fabricate trial base plates and occlusal rims for complete dentures," only 10.8 percent of the Dental Assistants and 1.7 percent of the Dental Hygienists indicated this procedure. Of the Dental Laboratory Technicians, 54.2 percent were involved in the task "complete simple denture repairs," but only 8.8 percent of the Dental Assistants and 1.7 percent of the Dental Hygienists reported this procedure.

The laboratory procedures involving a sufficiently high percentage of all three categories to be included in a core curriculum module were: 1) pouring of impressions: 50 percent of the Dental Laboratory Technicians, 21.6 percent of the Dental Assistants and 6.7 percent of the Dental Hygienists; and 2) fabrication of trays for preliminary impressions: 47.2 percent of the Dental Technicians, 14.7 percent of the Dental Assistants and 2.5 percent of the Dental Hygienists.

It is important to note that data secured from the present delivery system alone are insufficient to make final decisions as to inclusion or exclusion from curriculum. Perhaps if the personnel were well-trained in some of these laboratory procedures, their utilization would be higher. Judgments then have to be made not only on the basis of the current division of labor, but also suggested improvements that may effect a higher degree of office efficiency.

One other factor must be observed when considering incorporation of a procedure or technique into a curriculum. Although they may not actually lead to direct on-the-job performance, some procedures are nonetheless valuable teaching aids when introducing the variety of dental materials eventually worked with, or the principles of related and essential knowledge. A third factor is the desirability of early experience with procedures, perhaps in a core curriculum unit of instruction, which would assist both student and faculty to assess the manual aptitudes of the student. This early evaluation of psychomotor skills often helps to validate the student's initial occupational choice, or indicates the need for an alternative selection.

It is therefore desirable that each procedure be analyzed by experienced educators before being included or excluded from a curriculum. Subjective judgment, however, does not alter the value of hard data gathered through task analysis, when it is used as an objective modifier. Data representing difficulty and/or frequency can also be used to modify the sequence or emphasis factors of curriculum development.

As previously stated, one of the primary goals of the AHPP occupational surveys was the development of innovative instructional materials for selected allied health occupations. To ascertain what tasks are currently being performed and to provide a foundation for curricula development, occupational surveys were conducted in the dental auxiliary fields: Dental Assistants, Dental Hygienists, and Dental Laboratory Technicians.

The project staff used the information thus gleaned to identify tasks which should be incorporated into educational and instructional programs. Supplementary uses included: 1) information pertinent to the structure and sequencing of educational materials; 2) identification of "core" educational concepts; 3) identification of common and specific educational concepts existing among the dental auxiliary fields, and 4) assistance in culling non-essential items from the educational programs now being developed.

Previous sections of this report have elaborated on techniques, methods and the survey instrument used to collect the data, as well as the results obtained in each of the dental auxiliary occupations. The purpose of this section is to review the various methods of analyzing the data. Further supplementary uses of the data will be briefly discussed.

It was the opinion of the project staff that the survey data could be plotted on an orthogonal axis which could then be appropriately subdivided into a matrix. The specific location of the particular task in the matrix may indicate: 1) if the task should be included in the formal education or training program, and 2) the commonalities of tasks along with the appropriate sequencing. In an attempt to develop a task matrix, the data were combined, transformed, and plotted graphically in several different ways. These graphs usually indicated a slight degree of clustering or in some cases a very slight trend. However, in no cases were the results of substantial value. Due to time limitations, it was decided to revise and simplify the data analysis phase for this portion of the project.

The matrix concept was rejected as untenable; it was suggested that the workers were the most reliable source of quantifying the frequency of performing the task. On the other hand, the opinions of the worker concerning the manual skill and the knowledge required to perform the task were not considered as reliable nor as valid as the opinions of an expert committee or the National Technical Advisory Committee for the Dental Auxiliary occupations. The decision was made to utilize the frequency data from the survey as the primary criterion measurement for identifying tasks which should be included in the formal educational program.

A perusal of the frequency data led to the adoption of the following scale: 1) tasks receiving a performance indication of 20 percent or higher would automatically be included in the revised occupations task list; 2) tasks receiving less than 20 percent but more than 3 percent were immediately reviewed and a staff decision determined if the task was to be included; 3) tasks receiving 3 percent or lower response rate. The Committee considers each of these tasks individually and makes the final decision to exclude a particular task from the revised list. (See tabular materials in each section: pages 26-31; 38-41; 50-56, which indicate percentage of responses made for Dental Assistants, Hygienists, and Laboratory Technicians for each task.)

In order to use the frequency data from the survey as a criterion measure for secondary data, it was necessary to combine the percentage response rate with the mean frequency of the response. Dr. Cullen, Research Associate with the Allied Health Professions Projects, derived the following formula: [(6 - x) (% respondents)] six minus the mean response times the percentage of the respondents who indicated that they performed the particular task. The use of this formula permits combining information relating to the task frequency (several times a day to several times a year) and the number of respondents who indicate that they perform the task. It was assumed that this data would be very useful in alloting time and in sequencing educational concepts related to the tasks. For example, a task with a mean value of performance, several times a day and a 100 percent response rate should be alloted more educational time than a task with a mean value of performance several times a year and a response rate of 50 percent. Of course, other variables such as the difficulty of learning, the difficulty of teaching, etc., must also be considered; however, this type of input to curricula construction is likewise of great importance. (These data appear in same tables previously noted.) The next concern of the staff was to identify tasks which were performed by more than one type of dental auxiliary worker. Using the same formula (6 minus the mean times the percentage of the respondents), the task list for each of the auxiliary occupations was rank ordered from high to low. Tasks receiving a 20 percent or greater response rate were identified and noted. Tasks meeting or exceeding this factor for each of the dental auxiliary occupations were considered to be of sufficient common interest to be taught to all dental auxiliary workers, regardless of their occupational title. Similar judgments were made with respect to those tasks performed by any two of the dental auxiliary occupations. In the same manner, tasks related to only one of the dental auxiliary jobs were identified as being those receiving a 20 percent or higher response rate for a specific occupational title.

Tasks that received less than a 20 percent response rate were culled from the task list, critically reviewed, and a final decision as to elimination of the task from the curriculum was made on an empirical basis. The survey data strongly suggest that curricula committees should critically review and re-evaluate their decisions regarding the inclusion of a small number of tasks in the dental auxiliary programs. (Tables 24 and 25 indicate those tasks which should probably not be included in a formal educational program.)

Table 24. Tasks Common to All Auxiliary Groups in Order of Frequency of Performance

Order of Frequency	Task
1	Receive and place telephone calls.
2	Perform housekeeping duties.
3	Order Supplies

Table 25. Tasks Common to Dental Assistants and Laboratory Technicians in Order of Frequency

Order of Frequency	Task
1	Verify invoices.
2	Write checks and maintain balance.
3	Maintain state and federal tax records.
4	Prepare correspondence.
5	Prepare bank deposits.
6	Reconcile bank statement.
7	Prepare statements.
8	Sort incoming mail.
9	Maintain and rotate inventory.
10	Store and inventory precious metals.
11	Clean and maintain laboratory instruments.
12	Maintain dental laboratory equipment.
13	Pour, trim, and articulate casts.
14	Apply foil or tinfoil substitute to complete dentures.
15	Pour final impressions to produce master cast.
16	Care for preliminary or final impressions.
17	Give "on-the-job" instruction to subordinate personnel.

Table 26 lists tasks that are common to both Dental Assistants and Dental Hygienists in order of their frequency of performance.

Table 26. Tasks Common to Dental Assistants and Hygienists in Order of Frequency

Order of Frequency	Task
1	Adjust voltage, amperage, and timer of X-ray machine.
2	Apply paralleling (long cone) procedures for peri-apical radiographic survey.
3	Apply bisecting angle (short cone) procedures for peri-apical radiographic survey.
4	Evaluate dental radiographs for diagnostic quality.
5	Maintain unexposed radiographic film storage.
6	Mix solutions for developing and fixing radiographic film.
7	Apply bite-wing radiographic procedures.
8	Apply occlusal radiographic procedures.
9	Mount dental radiographs.
10	Label dental radiographs.
11	Clean X-ray processing equipment.
12	Position patient for radiographic examination.
13	Select film size appropriate for patient's mouth and indicate technique.
14	Select accessories for radiographic (X-ray) technique.
15	File dental radiographs.
16	Receive and place telephone calls.
17	Receive and dismiss patients and visitors.

Table 26. (Continued)

Order of Frequency	Task
18	Maintain accurate patient dental records.
19	Issue receipts.
20	Make ledger entries.
21	Maintain appointment control.
22	Maintain an active recall system.
23	Prepare bank deposits.
24	File business and patient records.
25	Perform housekeeping duties.
26	Collect fees for dental services.
27	Stabilize patient's mandible during operation.
28	Seat and dismiss patient from chair.
29	Explain post-operative instructions to patient.
30	Deliver and receive instruments at chairside.
31	Insert or remove cotton rolls.
32	Irrigate oral cavity for rinsing.
33	Make proper disposition and distribution of medical or dental records.
34	Take impressions for study models.
35	Remove impressions from patient's mouth.
36	Identify various types of dental instruments.
37	Recognize various types of dental equipment.
38	Care for various pieces of dental equipment.
39	Prepare instruments for and operate autoclave.
40	Retract patient's cheek, lips and tongue.
41	Prepare setup for prophylaxis (cleaning).

Table 26. (Continued)

Order of Frequency	Task
42	Prepare setup for fluoride treatment.
43	Prepare setup for periodontal treatments.
44	Assist with First Aid procedures.
45	Clean operatories and equipment.
46	Examine and sharpen instruments as required.
47	Change engine belt on low-speed engine.
48	Dispense medications when ordered by dentist.
49	Remove excess cement from crowns of the teeth.
50	Record oral conditions as directed by dentist.
51	Instruct patient in Oral Hygiene.
52	Prepare and chemically disinfect instruments.
53	Maintain chain of antisepsis.

Table 27 shows the tasks which are to be omitted from the basic curriculum of both Dental Assistants and Dental Hygienists.

Table 27. Tasks to be Omitted from the Basic Curriculum of Dental Assistants and Dental Hygienists

Task
Apply extraoral radiographic procedures.
Apply panoramic radiographic procedures.
Operate automatic processing equipment.
Prepare tax forms.
Apply coagulants or administer hemostatics.
Anneal gold foil.
Place gold foil as directed by operator.
Hand triturate amalgam.
Preserve and incubate bacterial cultures.
Receive from dentist and preserve biopsy specimens.
Assist dentist in hospital oral surgical procedures.
Hand mallet gold foil
Assist dentist in hospital operative procedures.

Further tasks that Dental Assistants and Dental Hygienists should not be taught to perform are duties classified as Dental Laboratory functions, except for the two tasks included in the core curriculum discussed earlier in this report. In the combined data it was noted that of the 118 dental laboratory tasks, only 19 received less than a 3 percent response rate; of these, 14 may be classified as general office and only four as technical laboratory tasks.

Table 28 shows tasks not performed by a sufficient number of respondents to warrant inclusion in curriculum.

Table 28. Tasks to be Omitted from Basic Dental Laboratory Curriculum

Technical Tasks
Fabricate cleft palate obturators.
Fabricate face masks for before-and-after presentations of special cases.
Fabricate electroformed dies.
Dehydrate refractory casts.
Sandblast chrome castings.
Office Tasks
Receive and dismiss patients and visitors.
Maintain accurate patient dental records.
Issue receipts.
Make ledger entries.
Maintain state and federal tax information.
Maintain petty cash accounts.
Maintain appointment control.
Maintain an active recall system.
Reconcile bank statement.
Arrange financial agreements.
File business and patient records.
Prepare tax forms.
Collect fees for dental services.
Assemble patient records for treatment.

Table 29. Expanded-Function Tasks for Dental Assistants and/or Dental Hygienists with Percentage of Respondents Reporting

Percentage of Dental Assistants	Percentage of Dental Hygienists	Task
3.9	2.5	Place rubber dam.
10.8	6.7	Remove rubber dam.
6.9	10.0	Place periodontal surgical pack.
7.8	14.2	Remove periodontal surgical pack.
3.9	8.3	Remove medication (dry socket).
9.8	5.8	Place matrix for amalgam restoration.
10.8	10.8	Place temporary cement.
6.9	5.0	Condense amalgam restorations.
1.0	1.7	Carve amalgam restoration.
13.7	15.0	Remove temporary cement.
0	37.5	Remove overhanging margins of fillings.
0	44.2	Remove excess cement from crowns of teeth.
6	21.7	Smooth enamel fractures.
21.6	20.0	Remove sutures.
22.5	25.8	Take impressions for study models.
17.6	3.2	Apply coagulants or administer hemostatics.

Table 29 presents those tasks judged to be expanded-function tasks. The percentage of respondents reporting these tasks as part of their job is given in order to indicate the current status of these functions.

Due to the relatively small number of respondents comprising the sample used in this study, the standard error of the measurement was calculated for each of the mean frequency scores. Table 30 portrays examples of those calculations for tasks having a response rate equal to or greater than 20 percent.

Table 30. Standard Error of the Mean for Tasks with a 20 Percent or Greater Response Rate

	Variable Number	Largest S.E.	Smallest S.E.
Dental Hygienist	141	.279	.017
Dental Assistant	138	.353	.021
Dental Laboratory Technician	94	.398	.120

It should be noted that the occupational task list was divided into two groups: those performed by 20 percent or more, and those performed by 19 percent or less of the respondents.

Table 31. Standard Error of the Mean for Tasks with a Response Rate Less than 20 Percent

	Variable Number	Largest S.E.	Smallest S.E.
Dental Hygienist	123	2.00	.00
Dental Assistant	81	2.00	.00
Dental Laboratory Technician	24	2.00	.00

Table 28 presents the number of tasks and the standard errors for tasks receiving less than 20 percent response. For Dental Hygienists there were 123; the standard errors range from a high of 2.0 to a low of .00 for these tasks. Both the high and the low standard errors resulted from a very few responses, in this case N=3 or less. It is obvious that with such a small number of respondents, the extreme range of error becomes possible; i.e., if two persons respond to a question and both answer identically, the standard error would be zero; conversely, of two persons answering a question, one responds at a high level (i.e., 5) and the other at a lower level (i.e., 1), then the resulting mean score has a large standard error.

On the basis of these data, one may safely assume that this survey reflects the average performance of the tasks listed in the survey questionnaire.

Seba Kolb, Editor

APPENDICES

APPENDIX A

NATIONAL TECHNICAL ADVISORY COMMITTEE FOR

THE AUXILIARY DENTAL OCCUPATIONS

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Los Angeles City College
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Committee
California Community Colleges
Director, Technical Information
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Southern California Dental Association
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Mrs. Hazel Torres
Coordinator of Dental Assisting
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William R. Woodworth
Dental Laboratory Training Program
Los Angeles City College
Los Angeles, California

Mrs. Lucille Giles
(Dental Assistant)
Ogden, Utah

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NATIONAL TECHNICAL ADVISORY COMMITTEE

FOR THE AUXILIARY DENTAL OCCUPATIONS

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Dr. Wayne Pack - Chairman
Miss Joy Bebbling
Dr. Nathan Boortz
Miss Margaret Ryan
Miss Rosemarie Valentine

Dental Assistant Subcommittee

Dr. Robert Montgomery - Chairman
Mr. Tom Beckham
Mrs. Lucille Giles
Miss Lois Kryger
Mrs. Hazel Torres

Dental Laboratory Subcommittee

Dr. Charles Strother - Chairman
Mr. Robert Gertz
Mr. Harold Globe
Mr. Otto Kramer
Mr. William Woodworth

APPENDIX B

REVISED TASK LIST

X-Ray Tasks

1.1 Supervise subordinates in operating dental x-ray equipment.

1.2 Adjust voltage, amperage, and timer of x-ray machine.

1.3 Apply paralleling (long cone) procedures for peri-apical radiographic survey.

1.4 Apply bisecting angle (short cone) procedures for peri-apical radiographic survey.

1.5 Evaluate dental radiographs for diagnostic quality.

1.6 Develop and fix exposed radiographic film.

1.7 Maintain unexposed radiographic film storage.

1.8 Mix solutions for developing and fixing radiographic film.

1.9 Apply extraoral radiographic procedures.

1.10 Apply bite-wing radiographic procedures.

1.11 Apply occlusal radiographic procedures.

1.12 Practice patient and operator safety measures for x-radiation.

1.13 Apply panoramic radiographic procedures.

1.14 Mount dental radiographs.

1.15 Label dental radiographs.

1.16 Clean x-ray processing equipment.

1.17 Position patient for radiographic examination.

1.18 Select film size appropriate for patient's mouth and indicated techniques.

1.19 Select accessories for radiographic (x-ray) technique.

1.20 File dental radiographs.

1.21 Operate automatic processing equipment.

Office Procedures

2.1 Receive and place telephone calls.

2.2 Receive and dismiss patients and visitors.

2.3 Maintain accurate patient dental records

2.4 Issue receipts.

2.5 Make ledger entries.

2.6 Verify invoices.

2.7 Write checks and maintain balance.

2.8 Maintain state and federal tax information.

2.9 Maintain petty cash accounts.

2.10 Maintain appointment control.

2.11 Maintain an active recall system.

2.12 Prepare correspondence.

2.13 Prepare bank deposits.

2.14 Reconcile bank statement.

2.15 Complete dental insurance forms.

2.16 Arrange financial agreements.

2.17 File business and patient records.

2.18 Prepare statements.

2.19 Sort incoming mail.

2.20 Perform housekeeping duties.

2.21 Order supplies.

2.22 Maintain and rotate inventory.

2.23 Prepare tax forms.

2.24 Collect fees for dental services.

2.25 Assemble patient records for treatment.

Chairside Procedures

3.1 Stabilize patient's mandible during operation.

3.2 Seat and dismiss patient from chair.

3.3 Apply coagulants or administer hemostatics.

3.4 Apply water to tooth during cavity preparation.

3.5 Cut suture material after typing by the dentist.

3.6 Explain postoperative instructions to patient.

3.7 Deliver and receive instruments at chairside.

3.8 Heat or prepare gutta percha for temporary stopping.

3.9 Insert or remove cotton rolls.

3.10 Irrigate oral cavity for rinsing.

3.11 Make proper disposition and distribution of medical or dental records.

3.12 Aspirate during oral surgery.

3.13 Apply air to keep cavity preparation dry.

3.14 Evacuate oral cavity during restorative procedure.

3.15 Take impressions for study models.

3.16 Hold impression in mouth after dentist places impression tray.

3.17 Remove impressions from patient's mouth.

3.18 Apply topical anesthetics.

3.19 Identify various types of dental instruments.

3.20 Recognize various types of dental equipment.

3.21 Care for various pieces of dental equipment.

3.22 Prepare instruments for and operate autoclave.

3.23 Prepare instruments for and operate dry-heat sterilizer.

3.24 Assist with oral surgery procedures.

3.25 Retract oral tissues in surgical procedures.

Chairside Procedures (continued)

3.26 Retract patient's cheek, lips and tongue.

3.27 Prepare setup for local anesthetic injection.

3.28 Assist with the administration of local anesthetic.

3.29 Assist with rubber dam application and removal.

3.30 Place rubber dam.

3.31 Remove rubber dam.

3.32 Assist with amalgam restorations.

3.33 Triturate amalgam-alloy.

3.34 Load carrier and place amalgam in cavity preparation.

3.35 Prepare setup for gold foil restoration.

3.36 Anneal gold foil.

3.37 Place gold foil as directed by operator.

3.38 Prepare setup for endodontics (root canal therapy).

3.39 Prepare setup for prophylaxis (cleaning).

3.40 Prepare setup for fluoride treatment.

3.41 Prepare setup for prosthetics.

3.42 Prepare setup for periodontal treatments.

3.43 Prepare tray setup for orthodontic treatments.

3.44 Assist with First Aid procedures.

3.45 Clean operatories and equipment.

3.46 Prepare dental materials for placement.

3.47 Prepare non-carpule hypodermic syringe for injection of medications.

3.48 Examine and sharpen instruments as required.

3.49 Cut and remove sutures postoperatively.

3.50 Apply hand mallet in surgical procedures.

3.51 Hand dentist triturate amalgam.

Chairside Procedures (continued)

3.52 Change engine belt on low-speed engine.

3.53 Preserve and incubate bacterial cultures.

3.54 Receive from dentist and preserve biopsy specimens.

3.55 Assist dentist in hospital oral surgical procedures.

3.56 Dispense medications when ordered by dentist.

3.57 Prepare hydrocolloid for impression.

3.58 Prepare rubber base material for impression.

3.59 Prepare compound for impression by dentist.

3.60 Prepare alginate for impression by dentist.

3.61 Fill alginate tray.

3.62 Prepare zinc phosphate cement for protective base.

3.63 Prepare silicate for restoration.

3.64 Prepare acrylic for restoration.

3.65 Place periodontal surgical pack.

3.66 Remove periodontal surgical pack.

3.67 Remove medication (dry socket).

3.68 Place matrix for amalgam restoration.

3.69 Place temporary cement.

3.70 Condense amalgam restorations.

3.71 Carve amalgam restorations.

3.72 Remove excess cement from crowns of the teeth.

3.73 Remove temporary cement.

3.74 Record oral conditions as directed by dentist.

3.75 Instruct patient in Oral Hygiene.

3.76 Hand dentist mallet gold foil.

3.77 Prepare and chemically disinfect instruments.

Chairside Procedures (continued)

3.78 Assist dentist in hospital operative procedures.

3.79 Assist with gold foil restoration.

3.80 Maintain chain of antisepsis.

Dental Hygiene Procedures

4.1 Greet patient and escort to dental hygiene operatory.

4.2 Position patient and operator.

4.3 Remove plaque and stain and polish teeth.

4.4 Clean interproximal surfaces of teeth with dental floss or tape.

4.5 Apply disclosing solutions to the teeth to identify bacterial plaque.

4.6 Apply fluoride to teeth isolated with cotton rolls.

4.7 Apply fluoride to teeth using the tray technique.

4.8 Apply fluoride using ionizing devices.

4.9 Identify abnormalities in soft tissues of the mouth.

4.10 Perform dental charting.

4.11 Identify deviate swallowing patterns.

4.12 Perform periodontal charting.

4.13 Identify extra-oral habits affecting occlusion.

4.14 Locate and assess the amount of stains and deposits.

4.15 Evaluate dietary habits and instruct patient on proper nutrition.

4.16 Select appropriate home care technique for each patient.

4.17 Give home care instruction.

4.18 Use ultrasonic devices to remove calculus.

4.19 Remove subgingival calculus.

4.20 Remove supragingival calculus.

4.21 Polish finished restorations.

4.22 Take and record patient's medical and dental history.

4.23 Recognize conditions indicated in history that require alteration in procedures.

4.24 Administer anesthetics (topical).

Chairside Procedures (continued)

4.25 Administer anesthetics (local injection).

4.26 Apply topical medications.

4.27 Prepare surgical periodontal packs.

4.28 Apply surgical periodontal packs.

4.29 Remove surgical periodontal packs.

4.30 Remove sutures.

4.31 Remove and insert temporary fillings.

4.32 Remove overhanging margins of fillings.

4.33 Smooth enamel fractures.

4.34 Maintain chain of antisepsis.

4.35 Sharpen instruments.

4.36 Plan sequence of procedures for appointment or series of appointments.

4.37 Desensitize hypersensitive teeth.

4.38 Give oral habit therapy.

4.39 Give physiotherapy instruction for temporomandibular joint difficulty.

4.40 Perform bedside oral prophylaxis.

4.41 Take and prepare oral cytologic smears.

4.42 Clean and polish removable appliances.

4.43 Perform root planning procedures.

4.44 Perform soft tissue curettage.

4.45 Supervise other dental auxiliaries in routine dental tasks.

Dental Laboratory Procedures

5.1 Store and inventory precious metals.

5.2 Clean and maintain laboratory instruments.

5.3 Maintain dental laboratory equipment.

5.4 Fabricate temporary removable bite raisers.

5.5 Fabricate cleft palate obturators.

5.6 Fabricate removable expansion appliances.

5.7 Fabricate face masks for before-and-after presentations of special cases.

5.8 Fabricate mouth guards.

5.9 Fabricate splints for immobilization of fractures of maxilla and mandible.

5.10 Fabricate temporary removable partial dentures.

5.11 Pour casts of othodontic deformities.

5.12 Fabricate othodontic space maintainers or retainers.

5.13 Cast gold crown, inlay or pontic backing.

5.14 Pour, trim, and articulate casts.

5.15 Fabricate broken stress or precision attachment bridges.

5.16 Fabricate copings.

5.17 Fabricate acrylic resin jacket crowns and pontics.

5.18 Fabricate amalgam dies.

5.19 Fabricate baked porcelain-to-gold restorations.

5.20 Fabricate electroformed dies.

5.21 Fabricate stone dies.

5.22 Finish and polish gold alloy inlays, crowns or fixed partial dentures.

5.23 Fabricate ceramic porcelain jackets.

5.24 Flask, pack, cure and deflask partial dentures.

5.25 Grind in porcelain or acrylic facings and pontics.

5.26 Pickle and heat-treat gold inlays, crowns, or pontics.

5.27 Polish or glaze porcelain facings, teeth or pontics.

5.28 Solder units of fixed partial dentures.

5.29 Sprue, invest, and burn out gold alloy inlays, crowns, or pontics.

5.30 Test occlusion and fit of inlays, crowns, or fixed partial dentures.

5.31 Wax-up and carve inlays, crowns or pontics for fixed partial bridges.

5.32 Set up artificial teeth on removable partial denture framework.

5.33 Sprue and invest wax-up for casting removable partial dentures.

5.34 Survey and design study casts.

5.35 Survey and design removable partial dentures.

5.36 Transfer design from master cast to refractory casts.

5.37 Trim and wax-dip refractory casts of removable partial dentures.

5.38 Wax-up, shape, and contour saddles for try-in or final processing.

5.39 Wax-up components of frameworks for removable partial dentures.

5.40 Adapt wrought gold clasps and bars.

5.41 Block out and relieve master casts.

5.42 Burn out wax prior to casting.

5.43 Cast metal framework for removable partial dentures.

5.44 Polish removable partial denture base.

5.45 Dehydrate refractory casts.

5.46 Duplicate master casts.

5.47 Estimate amounts of precious metals or chrome-cobalt alloys required for a casting.

5.48 Finish and polish metal partial denture frameworks.

5.49 Grind in tube teeth or facings.

5.50 Make trial baseplates and occlusal rims for removable partial dentures.

5.51 Pour refractory casts.

5.52 Remount removable partial denture prosthesis for occlusal adjustments.

5.53 Sandblast chrome castings.

5.54 Select teeth for removable partial dentures.

5.55 Assemble and repair complete dentures.

5.56 Duplicate complete dentures.

5.57 Reline dentures by articulator method.

5.58 Reline dentures by flask method.

5.59 Repair metal parts of removable partial dentures.

5.60 Replace tube teeth or facings.

5.61 Apply foil or tinfoil substitute to complete dentures.

5.62 Pour final impressions to produce master cast.

5.63 Care for preliminary or final impressions.

5.64 Characterize denture base material.

5.65 Design and position palatal reliefs.

5.66 Design and form post dam.

5.67 Fabricate trial base plates and occlusal rims for complete dentures.

5.68 Flask, pack, cure, and deflask complete dentures.

5.69 Eliminate wax from denture molds.

5.70 Fabricate artificial teeth for characterized dentures.

5.71 Finish and polish complete dentures.

5.72 Critically evaluate for processing errors.

5.73 Critically evaluate completed case.

5.74 Fabricate cast metal bases for complete dentures.

5.75 Fabricate impression trays from preliminary impressions.

5.76 Fabricate individual surgical trays for immediate dentures.

5.77 Remount complete dentures for occlusal adjustments.

5.78 Select artificial teeth for complete dentures.

5.79 Stabilize baseplates.

5.80 Wax-up and contour complete denture base for try-in or final processing.

5,81 Complete simple denture repairs.

5.82 Critically evaluate impressions and casts prior to fabrication of cast.

5.83 Interpret the dental prescription.

5.84 Bead and box complete or partial denture impressions.

5.85 Ditch the die.

5.86 Arrange artificial teeth in centric relation for complete dentures.

5.87 Arrange artificial teeth in balanced occlusion for complete dentures.

5.88 Fabricate immediate complete or removable partial dentures.

5.89 Solder component parts of removable partial denture.

5.90 Complete complex denture repairs.

5.91 Characterize and apply stains to porcelain f.. ngs, crowns, and pontics.

5.92 Supervise subordinate personnel in the laboratory.

5.93 Give "on-the-job" instructions to subordinate personnel.

APPENDIX C

SURVEY INSTRUMENT EXAMPLES

AND FACT SHEETS

2.1 Receive and place telephone calls.				
2.2 Receive and dismiss patients and visitors.				
2.3 Maintain accurate patient dental records.				
2.4 Issue receipts.				
2.5 Make ledger entries.				
2.6 Verify invoices.				
2.7 Write checks and maintain balance.				
2.8 Maintain state and federal tax information.				
2.9 Maintain petty cash accounts.				
2.10 Maintain appointment control.				
2.11 Maintain an active recall system.				
2.12 Prepare correspondence.				
2.13 Prepare bank deposits.				
2.14 Reconcile bank statement.				

Directions

Beginning with the first task on the first page below, read each task statement carefully and place a check mark (✓) in the column below the arrow beside each task which is now part of your job (or jobs if you are working in more than one office). Read each task on all pages until you have turned the last page.

NOW FOLLOW THE INSTRUCTIONS BELOW

1. Tear out this page. You may throw it away.
2. Return to the first page of the task list and follow further instructions.

EXAMPLE OF COVER SHEET

University of California, Los Angeles
Division of Vocational Education
Allied Health Professions Projects

DENTAL ASSISTANTS SURVEY

Office Information

Number of Operatories _____

	(Full-time)	(Part-time)
Number of Dentists:	_____	_____
Number of Assistants:	_____	_____
Number of Hygienists:	_____	_____
Number of Lab Technicians:	_____	_____

Type of practice: General _____ Specialist _____

If specialist please indicate specialty _____

Personal Information

Age _____ Years experience as Dental Assistant _____

Type of Dental Assistant training you have had:

On the job only _____

104 hour course _____

1 year college course _____

2 year college course _____

Private (Proprietary)
School _____

Other (specify) _____

Are you certified? Yes _____ No _____

Your major responsibilities during the day:

Receptionist _____ X-ray _____

Chairside _____ Office duties _____

Laboratory _____ All of above _____

Monthly salary range (not required) _____

EXAMPLE OF COVER SHEET

University of California, Los Angeles
Division of Vocational Education
Allied Health Professions Projects

DENTAL LABORATORY TECHNICIAN SURVEY

Where do you work: (Check One)

Private Office _____

Commercial Lab _____

If commercial lab, please specify:

Type of lab: General _____ Specialty _____

If specialty, please list specialty area _____

How many technicians work in lab _____

Personal Information

Age _____ Years experience as Dental Lab Technician _____

Type of Dental Lab training you have had:

On the job _____

Military _____

Manufacturers' Courses _____

1 year trade school or college _____

2 years college _____

Other (Specify) _____

Your major responsibilities:

General procedures _____

Full Dentures _____

Partial Dentures _____

Crown & Bridge _____

Ceramics _____

Orthodontic Appliances _____

Supervisor _____

Monthly salary range (not required) _____

EXAMPLE OF COVER SHEET

University of California, Los Angeles
Division of Vocational Education
Allied Health Professions Projects

DENTAL HYGIENE SURVEY

Office Information

How many dental offices do you work in each week _____

If only one, are you full-time _____ or part-time _____

For each office please fill in the following:

	Office #1	Office #2	Office #3	Office #4
Number of operatories	_____	_____	_____	_____
Number of Dentists	_____	_____	_____	_____
Number of Assistants	_____	_____	_____	_____
Number of hours you spend in each	_____	_____	_____	_____
Type of office (indicate general or type of specialty)	_____	_____	_____	_____

Personal Information

Age _____ Years of experience in Dental Hygiene _____

Type of training you have had:

Two-year college program _____

Four-year college program _____

Master's Degree _____

Other (specify) _____

Monthly salary range of or income range (not required) _____

University of California, Los Angeles
Division of Vocational Education
Allied Health Professions Projects

INFORMATION SURVEY

Name of Laboratory _____

Address of Laboratory _____

_____

Type of Laboratory: General _____ Specialty _____

If specialty, please specify type _____

Number of technicians: Full Time _____ Part Time _____

Names of Full time technicinas:

_____

_____

_____

_____

_____

_____

_____

_____

12/19/69
el

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SANTA BARBARA • SANTA CRUZ

DIVISION OF VOCATIONAL EDUCATION
ALLIED HEALTH PROFESSIONS RESEARCH
AND INSTRUCTION PROJECTS
825 S. BARRINGTON AVENUE, ROOM 305
LOS ANGELES, CALIFORNIA 90049

Dear Dental Auxiliary:

Your name has been selected as part of a national survey conducted by UCLA under the sponsorship of the U.S. Office of Education. We are asking your assistance in helping us to determine, through the survey, many facts about the Allied Dental Occupations which assist us in creating and improving educational programs designed to train dental auxiliaries for the future.

It would be of great assistance to our project and to the profession of dentistry if you would take a few minutes of your time to fill out the enclosed survey form, beginning with the cover sheet and continuing with the directions until all of the necessary data are completed. Following the completion of the survey form, it is to be placed in the enclosed return envelope and returned to our office.

Your cooperation and interest in this matter are greatly appreciated and it is hoped that through your cooperation important advances can be made in the education of more and better trained dental auxiliaries.

Sincerely,

R. D. Kingston D.D.S.

R. D. Kingston, D.D.S.
Senior Associate Director

RDK/el

National Association of Certified Dental Laboratories, Inc.

3801 Mt. Vernon Avenue / Alexandria, Virginia 22305 / (703) 683-5263

Dear NACDL Member:

You will find enclosed a copy of a survey form which is part of a nation-wide survey conducted by the University of California, Los Angeles supported by a grant by the U. S. Office of Education. We are soliciting your assistance in filling out this brief form indicating the type of laboratory which you operate and the names and type of technicians you employ. From this survey form names will be selected of working technicians who will shortly receive another, more extensive survey form designed to find out what specific tasks are being performed by whom.

The information gathered from this survey will be utilized by the UCLA Project staff to develop programs which will be designed to train Dental Laboratory Technicians to more nearly meet the needs of the laboratory operators and dental profession.

Your cooperation and support in this matter will be greatly appreciated and is encouraged by your National Association of Certified Dental Laboratories.

Sincerely,

Robert M. Gregory

Robert M. Gregory
Executive Director

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University of California
Division of Vocational Education
Dr. Melvin L. Barlow, Director
Dr. David Allen, Deputy Director
Elinor Shenkin, Administrative Assistant

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(Representatives of National Organizations in Health Fields)

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